School Shop

vol. IV no. 9
May, 1945

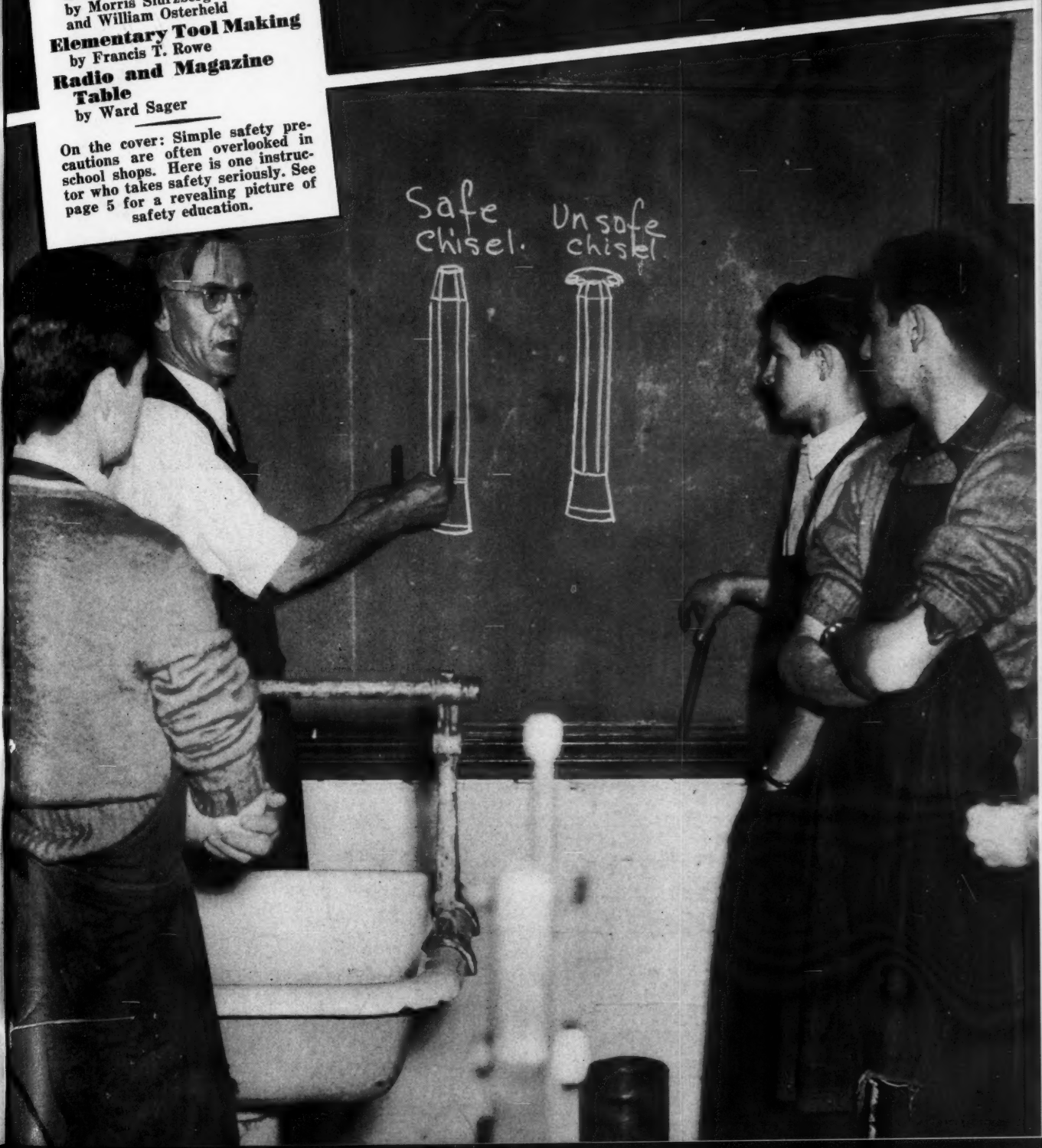
A Look at Shop Safety Education
by H. F. Hillebrandt

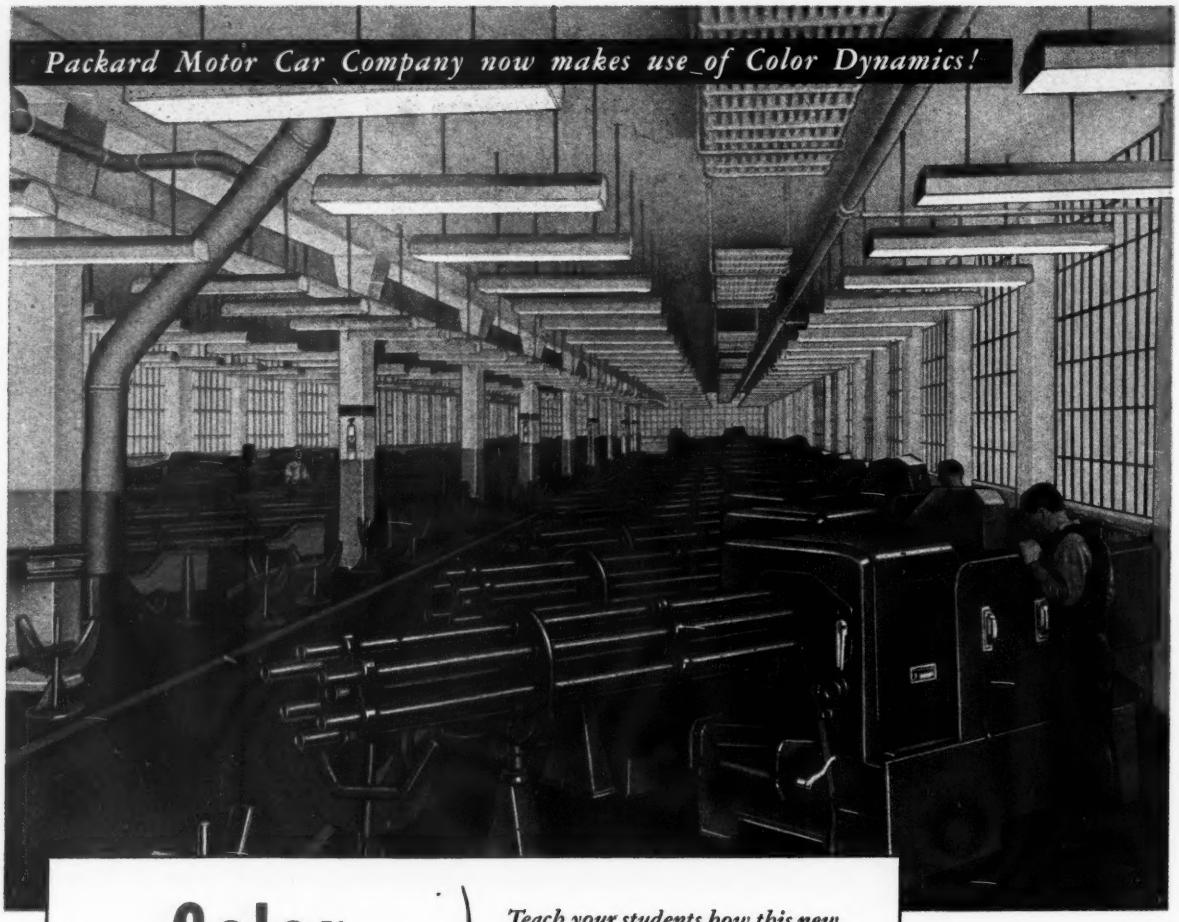
Electronics in the High School
by Morris Slurzberg and William Osterheld

Elementary Tool Making
by Francis T. Rowe

Radio and Magazine Table
by Ward Sager

On the cover: Simple safety precautions are often overlooked in school shops. Here is one instructor who takes safety seriously. See page 5 for a revealing picture of safety education.





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CONTENTS

A Look at Shop Safety Education. H. F. Hillebrandt..... 5
Observations by a state official of conditions of safety in school shops indicate that a more intensive program needs to be carried on in the schools.

Electronics in the High School. Morris Slurzberg and William Osterheld.... 7
Procedures for introducing this increasingly important aspect of shop training are discussed by the authors.

Elementary Tool Making. Francis T. Rowe.....10
Distinctly unusual is this course offered in a small high school with limited equipment.

Radio and Magazine Table. Ward Sager.....12
Here is an advanced woodshop project that is particularly timely.

Strictly Personal 16
About your fellow teachers.

In the Morning Mail 16
Comments from readers.

Cues from Industrial Drafting Technics. Eugene W. Larson.....18
Drafting teachers can profit from some of the newer technics now being used in industry by incorporating them in their own teaching says the author.

News 20
What's happening in the field of education.

Compact First-Aid Wall Kit. Philip H. W. Winsor 22
A sheetmetal project that has real utility.

Want a Handy Place for Your Drawing Board? Benjamin Gold.....22
A handy housekeeping device. The author also has an answer to the nail question.

School Shop Kinks.....24
Short cuts for making teaching easier and more effective.

Instructional Resources: Books, Pamphlets, Visual Aids.....26
Listings in easy form for clipping, pasting to cards, and filing. Keep your industrial-education bibliographies up-to-date.

News from Industry.....28
New products, new equipment, industrial advancements. Send in a coupon for free information and materials.

from Washington. Michael Paca.....32
News from the Nation's Capital of interest to shop teachers.

Index to Advertisers.....32

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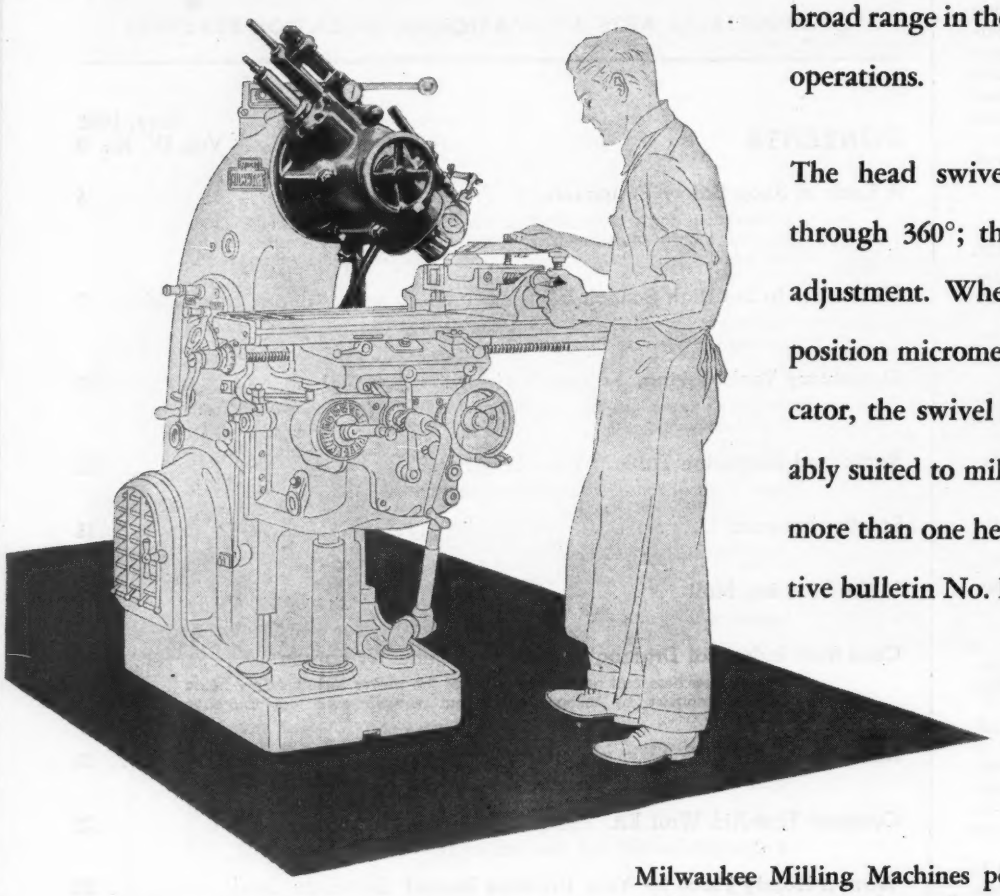

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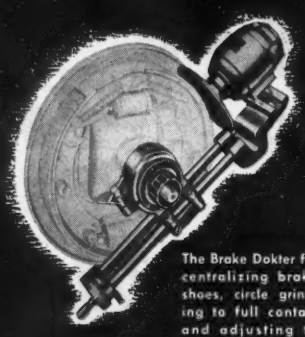

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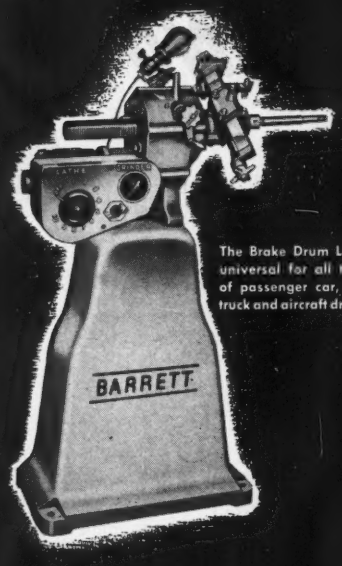

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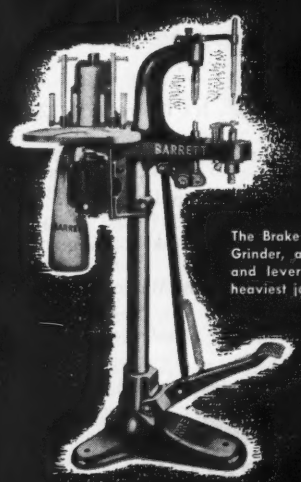

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A Look at Shop Safety Education

BY *H. F. Hillebrandt*

The writer's observations of safety practices in school shops indicate that much remains to be done on the part of teachers before adequate safety precautions and effective safety education are universally found in the shop departments of schools. H. F. Hillebrandt is Special Representative, Division of Safety and Hygiene, Industrial Commission of Ohio, Columbus.

IN going about over the State of Ohio in the prosecution of my duties as a representative of a state-sponsored safety agency, I have had occasion to come in contact quite frequently with school shops, their instructors and students. While many of them are properly staffed, well equipped, and ostensibly doing a very good job of instruction without overlooking the fundamentals of safety, some instructors are not only permitting unsafe practices on the part of their students, but even neglect their own safety when giving mechanical demonstrations. This practice entirely destroys the chance for lasting impressions by that most powerful of educational influences—the power of example.

In normal times, a relatively small percentage of accidents in industry fell on the younger age groups. This was due to commendable legislative restrictions on the type of labor and the working hours to which minors were limited as well as to the fact that a surplus of manpower made it unnecessary to make general use of the productive capabilities of minors. But now, however, the scene has changed. With the advent of war and its demands for maximum production, our surpluses of experienced manpower have been so thoroughly drained that industry has been utilizing the services of not only men and women who were no longer attached to the labor market because of age limitations or physical defects, but also mere children of both sexes.

The induction of these young people into active participation in a highly mechanized industry has developed a new and serious problem for personnel managers, safety engineers, supervisors, and foremen. Not only are they physically undeveloped but, as a rule, they have not the slightest conception of the tremendous hazards they face in the operation of intricate power-driven machinery. The exception is that those who have had safety-inspired training in school shops have received at least the rudiments of knowledge regarding the demands of production as well as its inherent hazards.

Here in Ohio, we have ample statistical evidence that this inexperience is contributing heavily to industrial accident tolls. As an example, in 1943, the Ohio record shows that 6341 workers of both sexes, under 20 years of age, suffered disabling injuries. This is 8.3 percent of the total of all such injuries during the year, a heavy increase over the preceding year, which was, in turn, above that of 1941.

All of which is by way of preface to stressing the point that, if these boys and girls are to be sent into the ranks of industry, oftimes before they finish their school training, it is highly important that they know what it is all about and that knowledge should, and must, come from the training and supervision they receive in shop classes.

Inasmuch as we are just emerging from a great tooling age in industry and, with the reconversion period fairly close at hand are merging into another, emphasis in many shops is being placed on lathe work. Now, ordinarily, there are no great inherent hazards in the operation of lathes that cannot be overcome by applying simple fundamental safety principles. Yet, in many cases, these are being ignored in schools with the result that the industrial establishments which eventually will get these students will have to take up safety instruction, not where the school instructor left off, but where he should have started.

In schools I have seen lathes started with the guards either entirely missing or out of position, with exposed set screws projecting from revolving parts, with hand tools and materials left on the lathe with the possibility of being jarred off, to the detriment of material and the safety of the operator. I have seen both students and instructors use files with bad handles and remove chips and turnings with bare hands instead of a brush, stick, or other safety device. I have seen work gauged while it was revolving with the possibility of inequalities in the stock jerking the gauge out of the operator's hand. Cleaning and oiling machines while in motion was also found to be quite common.

Despite the fact that 154 eyes were lost in Ohio industry during 1943, there was a lamentable disregard of ordinary precautions against eye injuries. Shields were either not provided or not used, and the use of goggles was the exception rather than the rule. Flowing neckties worn by student operators were a hazard quite frequently encountered. These derelictions were apparent not alone in the operation of lathes, but in the use of grinders, power saws, and other equipment where safe practices would require that they be observed.

One of the most frequent violations of safe practices which I found was in connection with the use of power rip saws. In the majority of cases such saws were being used without guards or splitters and in some cases no guard underneath the table. Joiners in some cases were found without guards. Such conditions actually exist in view of the fact that over 50 percent of all injuries received on woodworking machinery result in permanent disabilities.

In some cases grinders were found to have wheels that were worn down below

the edge of the flanges. Many were not equipped with steady rests. On others the rests were found to be improperly adjusted, being too far away from the wheel. I found many of them not equipped with protecting shields and the wheels and arbor ends not properly guarded. Here, too, the use of goggles was the exception rather than the rule.

In addition to the usual run of unguarded belts, pulleys, gears, etc., I found one other condition which was very apparent in the majority of school shops. This was the unsafe condition of a large number of hand tools: hammers with loose heads and rough handles; screw drivers with split and rough handles, sometimes badly bent and in need of grinding; chisels badly mushroomed and dull; wrenches with worn and sprung jaws.

Hand tools stand high in the list of accident causes and every care should be taken to see that such tools are kept in proper repair and good working order. Students especially should be taught the reasons for working with the proper tool in good condition and the serious results which might follow the failure to heed this practice.

There is no legitimate excuse which can be advanced for using hand tools in the school shop which are in poor condition and unsafe for use. To keep them in good working order does not require a great deal of time and much of the work can be done by the students themselves which in itself would provide them with valuable training. To overcome this situation instructors should carry on periodic inspections of all hand tools and when tools are found in bad condition necessary repairs and replacements should be made immediately.

School instructors, when asked about their failure to use saw guards, advanced several reasons for the absence of such guards. They stated that each operation to be performed was different and in many cases a guard could not be used. First it was a ripping job, then cross-cutting, then dado, etc. They were continually changing the blade and the set-up and as a result they found it more expedient to leave the guard and splitter off.

Maybe the community and the various boards of education should accept some of the responsibility for this condition because of failure to furnish the necessary finances for properly equipping school shops. It is a sad state when the school shop has only one saw available on which to perform the many necessary and varied operations which must be carried on to complete the students' instructions.

The same applies to the failure on the part of student and instructor alike to use proper eye protection in the shop. In most cases few goggles or face shields are available. As a result none are worn because the student or instructor hesitate to wear a pair of goggles or a face shield which has just been worn by someone else, and rightly so. It is an unsafe practice, just as sharing another's handkerchief would be. An adequate supply of goggles and face shields should be the regular equipment of every school shop, as well as facilities for their cleaning and sterilization.

All of the reasons advanced for failure to use proper safeguards must be overcome because they are not valid and cannot be justified. We should not attempt to teach a student a trade unless we include in those instructions the safe way to do the job. Certainly his training is not complete unless it is given on machines which are properly safeguarded and instructions given on the hazards involved and the reasons for using such safeguards or safety devices. In addition, there is a moral obligation which must not be overlooked—to safeguard the student in the school workshop.

What will be the reaction on the part of the student who has learned his trade on machines without guards or without using proper personal protective safety appliances when he goes into industry? His first reaction will be to try and remove the guards, feeling that they interfere with his work. If he is not properly supervised, the guards will be removed and, if he continues to work without such guards or safety devices, a serious accident is certain to result.

Lest it be inferred that school shop instructors are being singled out for criticism, be assured that the same conditions are to be found in many industrial establishments where the backlog of safety experience has been much heavier and where alibis for failure to observe the fundamentals of safety are far less tenable.

It is my conviction that each and every school shop department should adopt as a definite part of its curriculum a safety training program similar in character to those which are being carried on in some of our more successful industries. Such a program is not complicated or would it require too much of the students' time. Not only would it round out his education and make him a better worker but would provide him with knowledge that would help protect him against hazards of everyday life.

A brief outline for a program which could be successfully carried on follows:

I. Why Is an Industrial Accident Prevention Program Necessary?
   - A. National accident experience.
   - B. State and local experience.

II. Should Schools Participate in Industrial Accident Prevention?
   - A. Responsibility of schools in safety and accident prevention.
     1. To educate young people to become safe workers in industry.
     2. To safeguard the student in the school workshop.
     3. To develop an attitude of mind which will fit the student for safe living.

III. What Type of Program Can Be Carried on in the Schools as an Aid to Accident Prevention?
   - A. Setting up a safety organization.
     1. Selection of a safety director from student body to work with and under guidance of instructor.
     2. Organization of school shop safety committee and its functions.
     3. Safety meetings of committee and student body.
     4. Publicity.
   - B. Shop inspection.
     1. Physical and mechanical hazards.

(Continued on page 30)

Electronics in the High School

BY *Morris Slurzberg* AND *William Osterheld*

Instruction in the fundamentals of electronics will become increasingly necessary as the applications of this field of electricity expand in general use. Here are some points to consider before introducing the subject into the curriculum. The authors teach at the Wm. L. Dickinson High School, Jersey City, N. J., and are authors of the new textbook, "Electrical Essentials of Radio." The photographs are by Joseph A. Hoffman.

CONSTANT advertising by manufacturers of electronic equipment in the newspapers, in magazines, and on the radio has made the public conscious of the term "electronics" and of many of its applications. Electronic applications are used in nearly every field. The individual uses are too numerous to list, but a few of its more general applications are: home, industry, communication, transportation, amusements, scientific research, education, and therapeutics. Electronics is also being used in all fields of modern warfare to aid in achieving victory.

Because of the numerous applications of electronics, there is a definite demand for education in the field. This is a problem facing all educators and particularly those in industrial and vocational education.

Although the final solution to the problem will vary with the individual school, the local need, and the facilities available, the methods used will be similar for all schools. The following six questions should be answered before any definite program is established.

1. What is electronics?
2. What are the fields in electronics?
3. What types of positions are available?
4. For which of these positions can the school train its graduates?
5. Which subjects and which skills should be taught in order to train for these positions?
6. How are the subject matter and skills to be taught?

Electronics may be defined as the study of the electron and how it can be controlled to do work. The electron was discovered in 1897 by Sir J. J. Thomson, an English physicist. Since then, many men have contributed to the field of electronics. Through constant research and experimentation by these scientists, the vacuum and the gas tubes were developed. These tubes provided the means by which electrons could be controlled. Electronics is, therefore, the study of vacuum and gas tubes and their many applications.

By means of the electron tube, electronic devices have been constructed to do many things. These devices can be made to see, hear, smell, feel, taste, talk, measure, and calculate. Many different types of work are now being performed by electronic devices that not so long ago were considered impossible. Therefore no one can say definitely just what electronics may or may not do. Many of the electronic devices used in the manufacture and operation of military equipment cannot be divulged at this time and therefore it is impossible to make a complete listing of all the applications of electronics. The descriptive list of electronic applications given below can be used as a nucleus for determining the types of occupations for which a school should prepare its students. A more complete list can be found in the sources listed in the bibliography at the end of this article.

1. Communications:

This is the first large field to which the principles of electronics were applied. Development in the field of communication took rapid strides from about 1920 and has continued at an accelerated pace because of the popular demand for better equipment. This field includes:

Radio Transmitters of the following types—amplitude-modulated, frequency-modulated, ship-to-shore, aircraft, amateur, radio-telephone, radar, aircraft-beacon, trans-oceanic, and police.

Radio Receivers—In addition to the general receiver that is designed to receive signals from one or more of the types of transmitters listed above, there are a number of special types each designed for a definite use. This category includes the auto radio, the portable a.c.-d.c.-battery receiver, and the personal receiver.

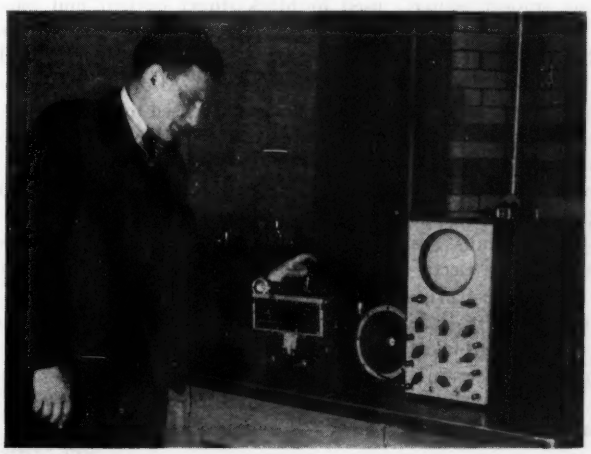
Telephony—inter-office communication and public-address systems.

2. Industrial:

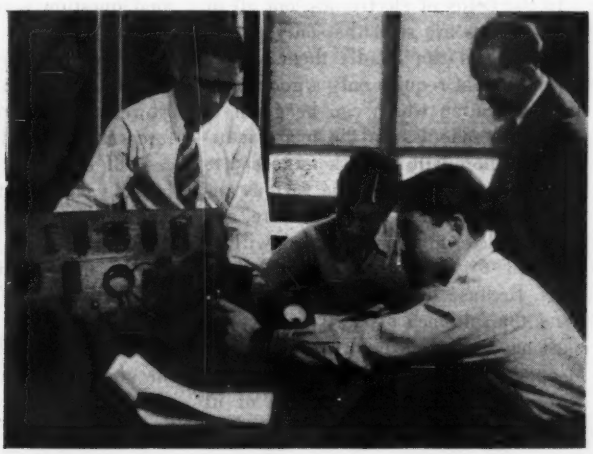
Although the application of electronics started much later in industry than in communications, this field has progressed at such speed that at the present time it is even a larger field than communications. Electronics as applied to industry can be divided into three broad fields: (1) process control, (2) safeguards and alarm systems, (3) measurements. A few of the many applications of each of these fields are listed below.

Process Control—Electronic welders—for general metal fabrication of parts for ships, automobiles, refrigerators, etc.; Register Controls—for counting, packaging, and automatic printing; Electronic Precipitators—for remov-

A demonstration with the aid of an oscilloscope by Morris Slurzberg, one of the authors, of how improper aligning distorts the output signal of a radio receiver.



Students under the direction of William Osterheld, one of the authors, measuring inductance by use of the a-c bridge. Note display panel on table.



ing dust particles in the control of the atmosphere in industrial processes; also for general air-conditioning; Ionization Ignition Control—for starting the flame in oil and gas burners; Magnetic Inspection—for determining the quality of iron and steel parts; X-Ray Inspection—for detecting flaws in the structure of metal parts; Radio-frequency Heating—for speeding up wood bonding processes; also for heating the preforms required in the manufacture of plastic molds; Electronic Sewing—for fusing thermoplastics and thermoplastic coated fabrics; Electronic Rivet-detonator—for expanding the tip of rivets; Photo-electric Skew Control—for controlling weaving processes; Photo-tube Color-separator—for grading eggs, fruit, etc.; Electronic Resonant Circuits—for controlling the thickness of paper and cloth; Photo-tube—for controlling illumination, opening doors, turning on the water at drinking fountains, etc.

Safeguards and Alarm Systems.—Infra-red Photo-tube Relays—for actuating burglar alarms; Liquid Level Control—for detecting floods; Photo-tube Smoke Control—for detecting fire; Ultra-violet Photo-tube—for detecting poisonous gases; Photo-tubes—used in conjunction with manually-operated equipment to stop the equipment when any part of the operator's body is in the path of motion.

Measurement.—Photo-tubes—for measuring the color of paints, pigments, and printing inks; Electronic Devices—for measuring vibration in materials and assembled units; Stroboscope—for measuring speeds of moving objects; also used in high-speed photography; Turbidity Meter—for determining the quality of drinking water; Vacuum-Tube Voltmeter—for measurement of small voltages; Oscilloscope—for determining the frequency, phase, and voltage of a circuit by means of the wave form.

3. Therapeutics:

Electronic Microscope.—This instrument is from 50 to 100 times more powerful than the best optical microscope.

X-Ray Equipment.—For photographing the internal structure of the human body and also for therapeutic purposes.

Inductothermy.—For producing heat within human tissues.

Electrocardiograph.—For obtaining a photographic record of the actions of the heart.

Oscilloscope (Specially constructed).—For determining the action of the foot muscles in the treatment of infantile paralysis.

In the fields of electronics, not all of the positions are such that only graduate engineers can handle them. There are many that require only a good technical education which can be given in most high schools. In the manufacturing field there will be workers needed to manufacture and to test the various circuit elements and to assemble, wire, and test complete units. Technicians will be required to install and service these units. Because of its technical applications, the salesmen of electronic devices must have a knowledge of the principle of operation of the devices they are selling in addition to a knowledge of its applications. The operation of many

Dickinson High School students testing radio tubes.

electronic devices is quite complex and trained operators will be required to properly handle such types of equipment. X-Ray technicians are a good example.

For which of these positions should a school train its pupils? The answer is determined by the type of school, the type of student, and the positions available in the particular community.

It is generally impracticable for a school to train students in all phases of electronics as the field is much too large. In many instances, no specific training can or should be given. A basic foundation of the electronic principles that are common to all types of electronic equipment should be offered. With this background a student can be trained by industry for specific applications. However, after a student has finished his basic training, other specialized courses in the more common fields of industrial electronics and communications may be given if there is sufficient local need.

And now for consideration of the final question regarding subject matter and skills.

The basic electrical essentials of electronics and electricity are the same. However, there are three important differences that must be considered. In the case of electronic circuits (1) a much larger variety of types and sizes of circuit elements is used than in the average electrical circuit, (2) the circuits are more complex than are average electrical circuits, and (3) many of the principles of electricity that have very little significance in the average electrical circuit are very important in electronic circuits.

One method of teaching the variety of circuit elements will be found in an article by the same authors on pages 14-16 of the January, 1945, issue of SCHOOL SHOP.

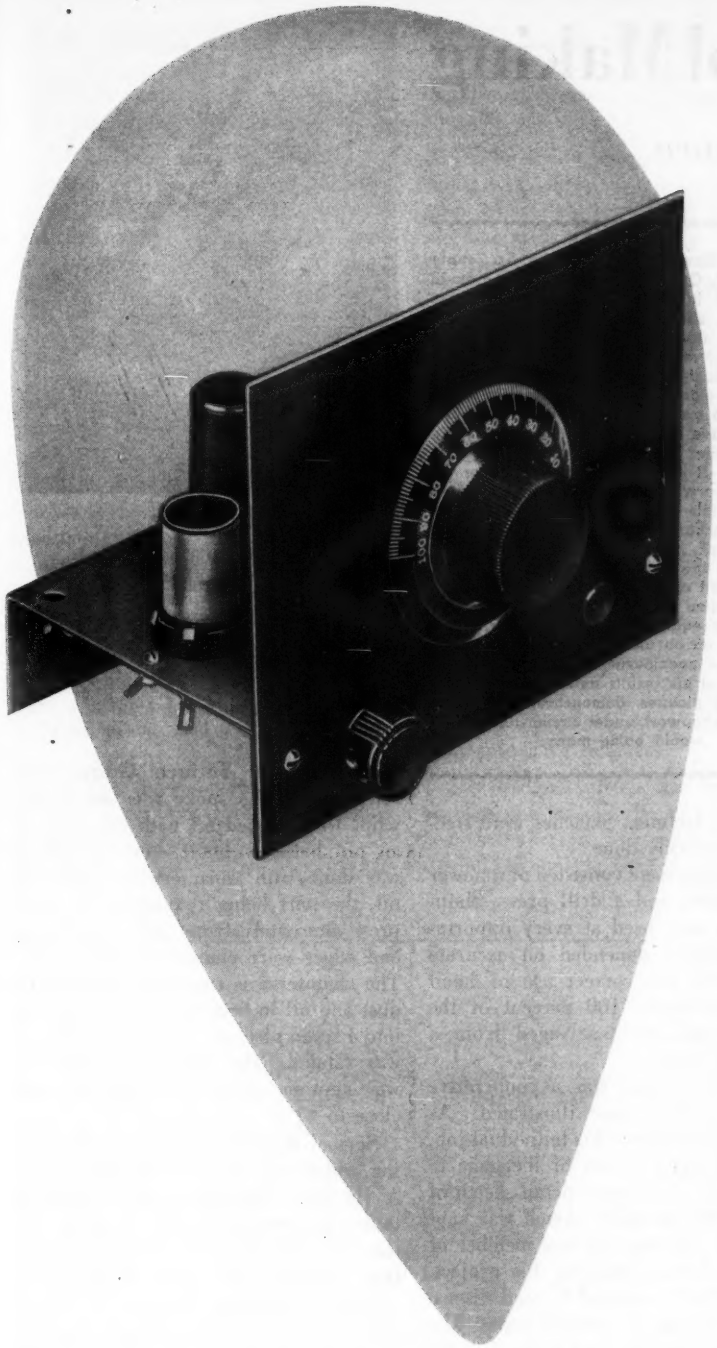
Electronic circuits are quite intricate and complex and, when a circuit diagram is examined, may seem very confusing. Every electronic circuit is made up of a number of individual circuits, each designed to accomplish a definite purpose. In order to understand the complete circuit, each individual circuit should be analyzed separately. These individual circuits may be a series, parallel, combination, or complex circuit. No matter how complex a circuit may be, it can always be resolved into a simple series or parallel circuit. A thorough understanding of series and parallel circuits is therefore essential. After this basic foundation is mastered, the combination and complex circuits peculiar to electronics can be analyzed.

Every wire-wound resistor has, in addition to its resistance, a capacitance and an inductance effect. Every capacitor has, in addition to its capacitance, a resistance and an inductance effect. Every inductor has, in addition to its inductance, a resistance and a capacitance effect. These stray effects are negligible at the ordinary power frequencies, but become effective at the high frequencies used in some of the electronic circuits. Because of these stray effects, shielding, types of circuit elements, and methods of wiring become important factors.

There may also be various currents of different frequencies flowing in an electronic circuit. In order to separate the current of the desired frequency from those of the undesired frequencies, filter circuits are used. These filter circuits may be very simple or they may be very complex, depending on the results desired. For example, a capacitor may be used to block direct current and pass alternating currents; an inductor may be used to block alternating current and pass direct current. Also, a series resonant circuit may be used to pass the currents within a narrow band of frequencies and to block the currents of all other frequencies; or a parallel resonant circuit may be used to block the currents within a narrow band of frequencies and to pass the currents of all other frequencies.

It has been previously stated that an electronic circuit is made up of a number of individual circuits. Various methods are employed for coupling these cir-

(Continued on page 14)



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Elementary Tool Making

BY *Francis T. Rowe*

TESTED SHOP PROJECT

THE problem of presenting a worthwhile metal course in a small high school with little machine-shop equipment and at minimum cost for materials was met last year with a course which we called "elementary tool making." It was found that the course not only resulted in the execution of a wide variety of tool processes, but it also gained for the pupils a good working acquaintanceship with many tools and instruments of the metal trades which they would not have ordinarily understood. Moreover, the course presented an unusual opportunity for the development of the highly desirable habit of meeting new problems with a relish.

The following projects were developed by individuals: inside calipers, outside calipers, hermaphrodite calipers, setting-down hammer, two types of tap wrenches, machinist's jack, two types of small metal vises, trammel points, center punch, rivet set, and combination marking gage-depth gage.

Considerable emphasis was placed on efficient workmanship and neatness, even to the point in some instances of buffing all surfaces to a mirror finish as a last step.

Each pupil was assigned one tool to make from a picture. His objective was to produce a tool which resembled the picture as closely as possible. First the use of the tool and its characteristics were explained thoroughly to each worker. Then a sketch was developed with the help of the instructor. Every detail of construction was worked out and noted on the sketch so that everything could be done with our equipment. Emphasis in the sketches was on completeness of detail rather than on perfection

Francis T. Rowe teaches in the Tri-County High School, Queen Anne, Maryland, a small high school in the truck-farming district on the eastern shore of Maryland. He writes, "I feel that this project may have value for some of your readers who teach in rural high schools of limited financial means and relatively small classes. Our school has four teachers, 70 to 75 pupils, and grades eight through eleven. I have a 'modified general shop'. We have a rather novel situation from several standpoints. It is especially favorable for experimentation with small classes and a schedule so flexible that some boys have been allowed to take as much as 15 hours of shopwork a week. Also novel, I believe, is the fact that for the past six years shopwork has been required of all girls during the first two years and open to girls in the last two years." With serious equipment limitations, Mr. Rowe has carried on an unusual program in metalworking. The ingeniousness of his methods and the quality of his results as shown in the accompanying pictures demonstrate what can be done in shopwork under circumstances that would baffle many.

in drafting technic. Sketches were freehand and quickly done.

Power equipment consisted of a power grinder-buffer and a drill press. Shop-made jigs were used at every opportunity. Precision depended on accurate layout work and correct use of hand tools. Practically 100 percent of the materials used were salvaged from a local junk heap.

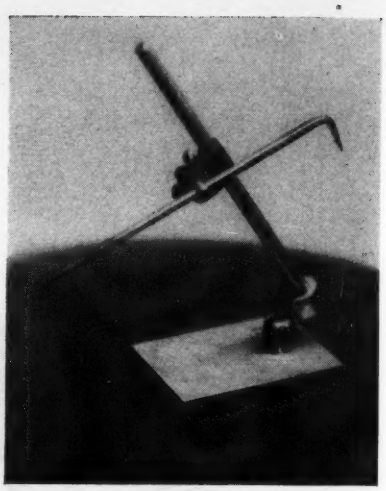
The final project was a cooperative one, the surface gage illustrated. As each pupil completed his individual job, he was assigned a part of the gage to make. Each was given a detail sketch of his part; the assembly sketch was kept posted for reference by any member of the class. Before work on this project, each pupil was required to read discussions of its use in several texts. The necessity of accuracy and of good fit between parts was understood.

The list of materials will show that the metal used was part of an old silo band, a wagon axle, and spokes from the discarded wheel of a model "A" Ford. (Some jobs would have been easier had they been started with material more nearly the required size, but part of the value to the workers might thus have been lost.)

Following is the list of materials:

Part

A—1 pc. ⅛"x2"x3" from an old silo band.
B—2 pcs. ¾"x¾"x3" from an old wagon axle.



C—1 pc. ¾"x¾"x¾" from same axle.
D—1 pc. ¾"x¾"x1" from axle.
E—1 pc. ¾"x¾"x1¼" from axle.
G—1 pc. ¼" round x 1" from spoke of model "A" wheel.
H & I—2 pcs. ¼" rd. x 6" from spoke.
J—1¼" wing nut.
K—8-3/16"x1" iron rivets.
F—1-3/16" x ½" stove bolt, with sq. nut L.

Making the Surface Gage.—For rod I, 6" of the spoke was sawed off, paint was scraped off with the back of an old hacksaw blade, and smoothing was done with worn emery cloth and oil, the part being rotated in the drill press alternately from each end. Sharp end edges were chamfered with a file. The chamfer was smoothed with emery dust and oil in bottom of a hole drilled into a scrap piece of metal, while the rod was rotated. The diameter of the rod was kept as uniform as possible and close to ¼".

Scriber H involved a great deal of filing which was done in the drill press. A jig was clamped to the drill-press table, furnishing a solid backing for the rod while filing to minimize vibration. Special care was exercised to achieve a uniform diameter of 5/32" over the center 3". One and a half inches of each end were tapered to a point, the whole part polished, and then ¾" of one end bent at right angles. The tapered ends were hardened by heating to red heat in blowtorch flame and quenching.

The slide swivel clamp D was formed from a solid piece of steel, ¾" x ¾" x 1". After the piece was squared out and smoothed, the piece was carefully laid out in full. The two holes were drilled first and then successive sawings and filings executed, as illustrated in sketches 3, 4, and 5. All external surfaces were smoothed with emery cloth. The saw

slot was smoothed with a flat needle file and then emery cloth wrapped around a piece of hacksaw blade. Finally the piece was heated red hot and quenched to give it the necessary "spring."

Part G was made by threading 3/8" of a piece of 1/4" round metal with hand dies and then drilling a 5/32" hole through it, sawing the metal off to 3/4" length, and rounding the end. The hole was carefully centered for strength. See Fig. 6.

Wing nut J is a standard 1/4" wing nut, ground and filed down to such size and shape that it will rotate freely and not look disproportionately large for the rest of the instrument. Care was taken to keep the two wings uniform. To facilitate holding and to lessen the chances of being burned while grinding, the nut was backed onto a piece of scrap 1/4" metal, threaded a short distance on one end.

Hinge clamp E was laid out and formed in the same manner as clamp D, as described above. For this piece to have enough friction both in the hinge joint and in the rod-clamp end, it must be formed so that, with the rod hole at 1/4", the slot widens slightly from the hole to the ends of the legs. When mounted considerable tension results (Fig. 8). (This is one point where your pupil might devise a structural improvement.)

The lower hinge member C was sawed and filed from 3/4" square to 1/2" square, then octagonal, and then round. The slot was made with saw, cape chisel, and file and then fitted with a metal filler to allow further working without bending the two prongs bounding the slot. The lower end was filed to 3/8" round. To keep the shoulder square a jig was contrived, as shown in Fig. 7. Then, after the hole was drilled, flats were filed on each side of the slot, the deeper one being fitted snug to the square nut. The slot filler was not removed nor the ends of the prongs smoothed until the part was mounted in the base because of the possibility of damage to prongs in upsetting from below.

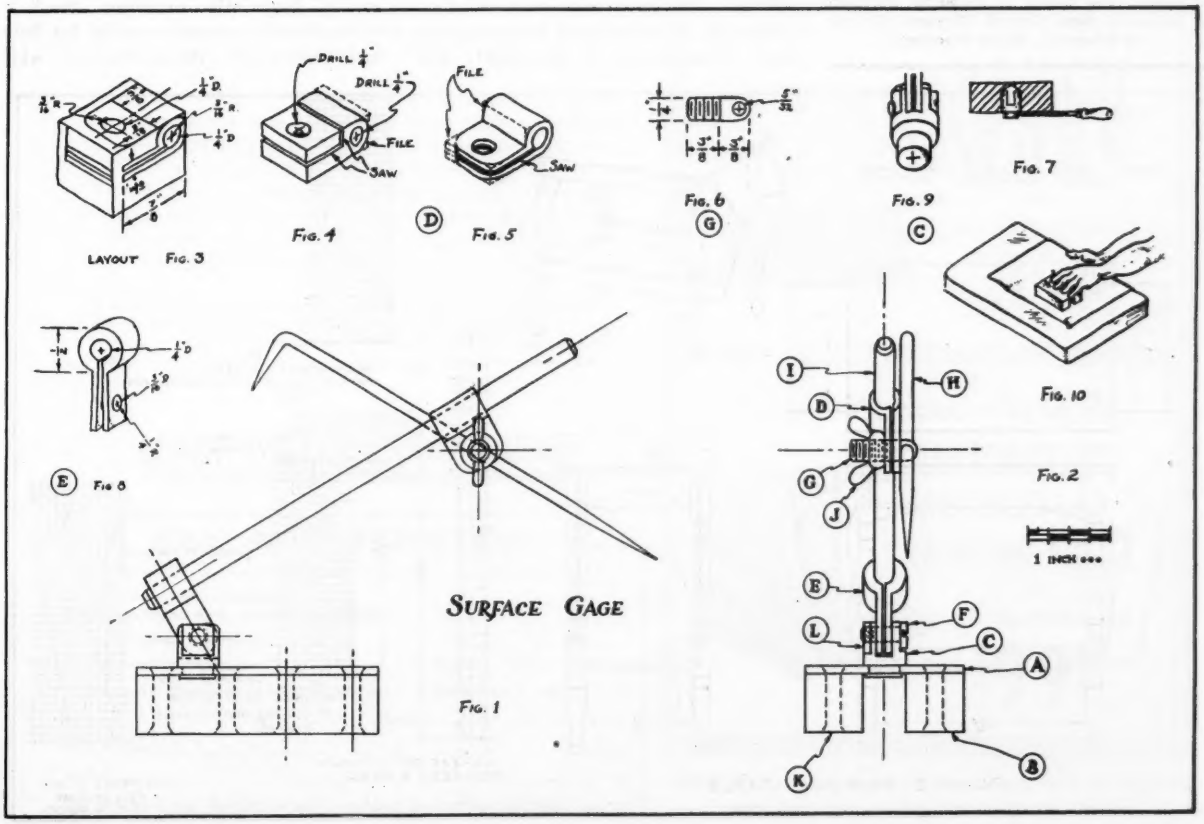
The bolt F and nut L were standard 3/16" stove bolt and square nut; the head of the bolt was filed flat and the nut filed to fit the contour of the lower hinge piece for neatness.

The base, completed, has the appearance of one solid piece of metal. The heavy members, B, were filed square and true and the part A cleaned and surfaced accurately. Final smoothing of these surfaces was done by rubbing on a sheet of emery cloth, backed by a flat steel surface, great care being necessary to avoid rounding corners and edges. Once fitted, the jointing surfaces were tinned, clamped in position, and 8 holes drilled and countersunk for 3/16" rivets. The parts were riveted together and the unit heated with a blowtorch so that the tinned surfaces might adhere.

The completed base was then trued up perfectly and smoothed with the broad side of a rotating emery wheel and by rubbing on the metal-backed emery cloth (Fig. 10). The 3/8" hole in part A was laid out and drilled.

The last step before final assembly was attachment of the lower hinge member, C, to the base. The lower section of C was pressed through the hole, inverted, and the rim upset around the margin by a circle of centerpunch marks. Thin vaseline was applied to prevent rusting.

The surface gage has been used in the shop for many jobs since it was made, as have every one of the other tools made. The "elementary tool making" course will serve as our third-year metal unit this year.



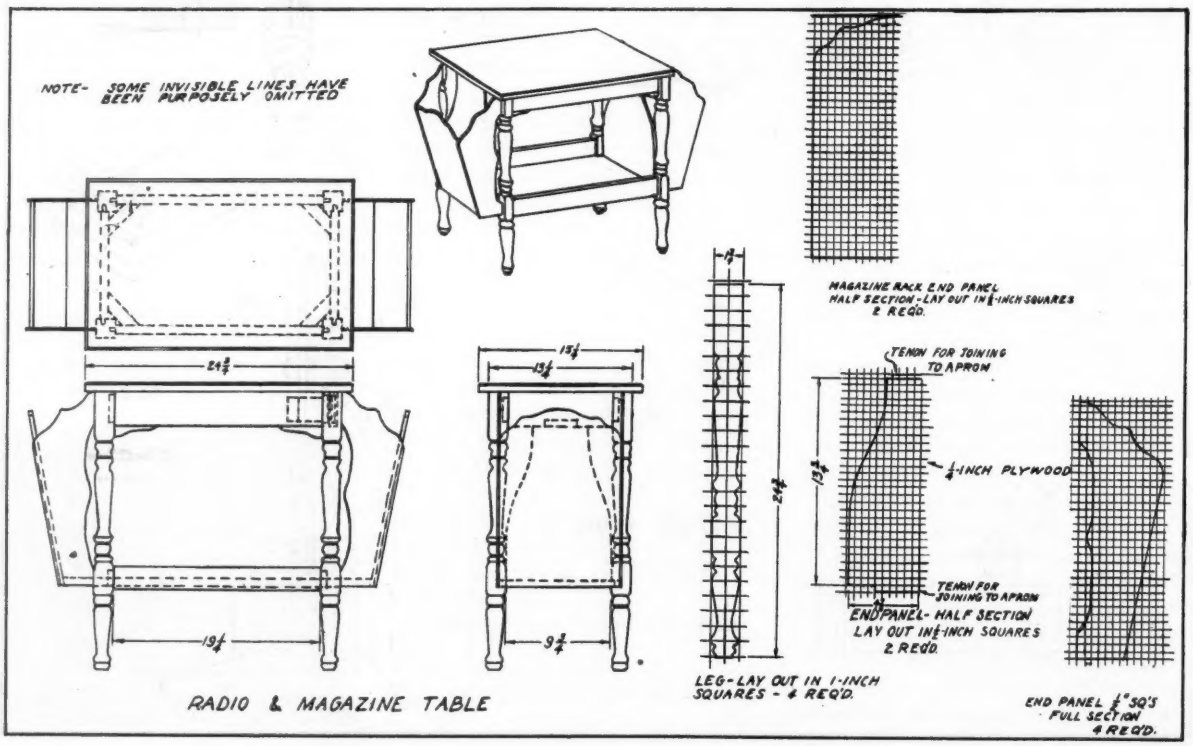
Radio and Magazine Table

BY *Ward Sager*

This project for advanced students in woodworking is timely as the summer season approaches. The author is Associate Professor of Industrial Arts, Central Michigan College of Education, Mount Pleasant.

THE table shown was constructed of selected ponderosa pine to match the knotty pine furniture and woodwork of a summer cottage. The design was suggested by a picture in a magazine of home furnishings. Constructed of thoroughly seasoned walnut, red gum, or other cabinet wood, a project of this type is both useful and practical from an instructional standpoint. While its construction will require careful planning, accurate layout, some skill in lathe turning and in the making of joints, it should not prove too difficult for high-school students in shops equipped with woodworking machinery. As several mortise-and-tenon joints are required, a hollow chisel mortiser would be very helpful; however, the mortises could be cut with hand tools.

Planning the procedure and selection of material for the project would be the starting point. The first step in construction involves the layout of patterns for the legs and end panels on fairly stiff paper by the method of squares as indicated on the drawing. Half-patterns may be laid out, the paper folded along a center line and the opposite half traced therefrom. Four pieces of square turning stock about 28" in length are required for the legs. The paper template is used for laying out the lathe turning for the first leg and this leg can then be used for checking the remaining three. They should be as near perfect duplicates of the first leg as is possible. The second step might be to join and glue up material for the top and shelf which are ¾" thick after finishing. Stock 5′ in length will provide material for both with little waste. The apron is 3" wide


NOTE- SOME INVISIBLE LINES HAVE BEEN PURPOSELY OMITTED
24¾
19¼
13¼
13¼
9¾
18
24¾
MAGAZINE RACK END PANEL HALF SECTION - LAY OUT IN 1-INCH SQUARES 2 REQ'D.
TENON FOR JOINING TO APRON
¼-INCH PLYWOOD
13¾
TENON FOR JOINING TO APRON
END PANEL - HALF SECTION LAY OUT IN 1-INCH SQUARES 2 REQ'D.
LEG - LAY OUT IN 1-INCH SQUARES - 4 REQ'D.
END PANEL 1" SQ'S FULL SECTION 4 REQ'D.
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and approximately 6 linear feet is required. Two pieces are cut 20¾" in length and two pieces 10¼" long to allow for ¾" tenons on each end. The two lower rails are 2¼" wide and are also 20¾" long with ¾" tenons. The lower rails are dadoed, ¼" deep and ¾" wide for the shelf. After the mortises are cut in the square portions of the legs, the frame may be temporarily assembled while fitting the top board and shelf. The overhang of the top is 1" all around measured from the square portion of the leg. For an edge moulding around the top, a rabbet can be cut and the resulting square edges rounded with sandpaper as shown by the photograph and orthographic views of the drawing.

It should be noted that the shelf extends beyond the legs at each end to provide bottoms for the magazine holders. A through mortise, not over ¼" deep, should be cut in the square of the leg to make a good joint for the shelf. The two end panels for the vertical space between the apron and shelf may be cut from ¼" plywood. A tenon on the top and bottom of each panel is mortised into the apron and shelf respectively. The sides and end panels of the magazine holders are also made from ¼" plywood. The sides are mortised into the legs about ½" and fastened along the bottom edge to the shelf with small finishing nails.

After a trial assembly shows that all parts fit properly, the frame of the table, including the shelf and end panels, may be permanently assembled with glue. Next, the top is fastened to the frame with four corner brackets and wood screws as shown on the drawing. The magazine holders are assembled last and clamping should be unnecessary if the ends fit into the mortises in the legs properly, as fastening the ends to the shelf with small finishing nails will hold them in place. The end panels can be edge glued and secured with 1" brads. For decorative effect, four small pieces may be cut out and fitted into the corners where the apron is joined to the legs. All the pieces should be finish sanded before the final assembly. Then, if care is exercized in applying glue and in clamping operations, the project will require only fine sanding before applying the final finish.

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Electronics . . . . . *from page 8*

cuits in order to form the complete circuit. The type of coupling device used will depend on the circuits being coupled and the results desired.

From the above discussion of electronic circuits it can be seen that the electrical essentials of electronics are much more complex than the electrical essentials of power circuits. The ordinary electrical background is generally not sufficient for a student preparing to study any one of the branches of electronics, hence a special electrical course featuring the essentials of electronics should be given.

1. Textbooks.

Morris Slurzberg and William Osterheld, *Electrical Essentials of Radio.* McGraw-Hill Book Company, Inc., New York.

Arthur Lemuel Albert, *The Electrical Fundamentals of Communication.* McGraw-Hill Book Company, Inc., New York.

2. General electronic information that can be obtained free of charge from manufacturers.

Educational Service, Radio Corporation of America, R.C.A. Victor Division, Camden, *N.J.: Electrons in Action at R.C.A., Electronics in Industry, Planning Tomorrow's Schools, R.C.A.—What it is—What it does, Radio-Electronics in Education.*

General Electric Publications on Electronics, General Electric Co., Dept. 6-215, Distribution Section, Schenectady, N.Y. This is a complete descriptive list

(Continued on page 30)

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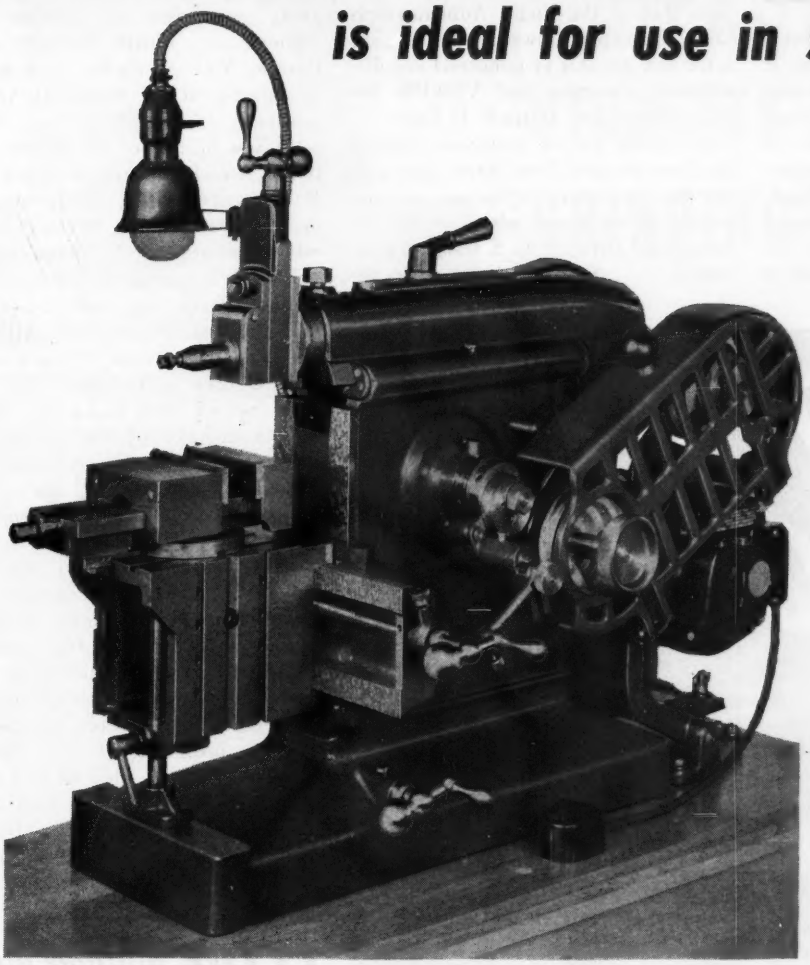

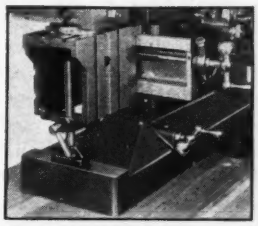

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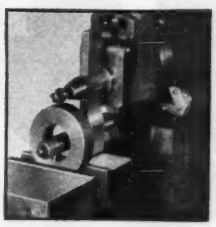

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R. D. BUNDY, director of vocational training for war-production workers in the Cleveland, Ohio, schools, has been elected president of the Vocational Trades and Industries Association of Ohio. . . . J. A. GUITTEAU, state supervisor of vocational agriculture for Washington and vice-president of the American Vocational Association, died recently at 55 years of age as the result of an accident when fumes escaped from a heater. . . . ELDON IMHOFF, former associate visual education specialist with the War Department, has been added to the sales staff of the Victor Animatograph Corp., Davenport, Iowa. . . . W. R. CATE is the new director of industrial and distributive education and VTWPW for Texas, succeeding JAMES R. D. EDDY. . . . COMMANDER FRANK CUSHMAN, USNR, has been released from active duty with the Navy to return to his post as consultant in vocational education for the Vocational Division, U. S. Office of Education. . . . New appointments in the Massachusetts State Department of Vocational Education are DANIEL H. SHAY, assistant director; THOMAS L. FLYNN, senior supervisor; and JOHN F. WOSTREL, supervisor of private trade schools. . . . EDWIN SWENSON of the Passaic, N.J., schools has been appointed director of the Industrial Arts Department, Clifton, N.J., High School. . . . New officers of the Kansas Vocational Association are president, FRED H. SCHULTIS, Great Bend; vice-president, RALPH J. COILE, Wichita; and secretary-treasurer, F. E. CARPENTER, Topeka. . . . LESTER L. FEHR of State College, Penna., has been named director of industrial education, Allentown, Penna. . . . CLARENCE W. SAUL, former shop teacher in the Roosevelt Junior High School, New Brunswick, N.J., is now a member of the industrial-arts faculty of the Pine Grove, Penna., High School. . . . WILLARD JARDINE of the Roosevelt Junior High School staff, New Brunswick, N.J., is now teaching woodworking in the Clearwater, Fla., High School. . . . JOHN F. RIDER, author and publisher of radio technical books, has recently been promoted from captain to lieutenant colonel in the Army. . . . JAMES MCKINNEY, former vice-president and educational director, has been appointed president of the American School in Chicago, while C. M. ELLIOTT, secretary and director of field service, has been made vice-president. Both officials have spent over 25 years in vocational and home-study education.

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IN THE Morning Mail . .

[Brief comments about SCHOOL SHOP and the field it serves are invited. Address the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

Gentlemen,

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HOWARD P. SKINNER,
Public Schools,
Marquette, Mich.

[Lists of teaching personnel together with school addresses and subject matter taught are always welcomed by the Circulation Department of SCHOOL SHOP so that our mailing lists may be kept as up-to-date as possible.—*Editor.*]

Gentlemen,

SCHOOL SHOP is fine. I always look forward to receiving it. Please continue sending it to me for another year.

GLENN E. MARION,
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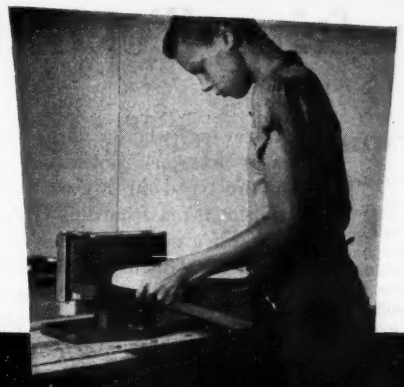

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Cues from Industrial Drafting Technics

BY *Eugene W. Larson*

The author, who has spent several summers working in the drafting rooms of various industrial plants, concludes that teachers can profit from some of the newer technics being utilized by industry. Some of the proposals differ radically from old, established drafting practice. Eugene W. Larson teaches mechanical drawing at the Ann Arbor, Michigan, High School.

TEACHERS of drafting are often puzzled when they learn that industry has adopted new technics in drafting practice with which they are unfamiliar. These technics are being developed constantly as a result of experience and are accepted only after being tested in practice. If the drafting teacher wishes to become familiar with the new ideas and if he expects to keep up-to-date in his field, he should take a part-time or a summer job in the engineering department of some manufacturing firm.

If the teacher is successful in securing a position, he should not be surprised if the chief draftsman appears skeptical of his preparation and qualifications for the job. If the chief draftsman is quite frank, he may even tell the beginner that he has much to learn. However, if the teacher is willing and shows evidence of a desire to learn, the men with whom he will work will be found to be most helpful. At first there will be much that is different; some things will appear that are contrary to what he has been teaching. This should not discourage him. If he can swallow his pride and if he can restrain himself from attempting to revolutionize the office, there is much to be learned.

The writer has had this experience on several occasions in different plants and, as a result, makes the following observations. In the first place the employers have learned that in many cases it is a waste of time and money to make an ink tracing of a drawing. Some drawings are made directly on tracing paper or cloth and, in order to make additional saving, standard borders and name plates are printed on the sheets. The name plate is complete with company name and spaces for limits and tolerances, bill of material, and alterations.

Drawings are made with several grades of medium soft drawing pencils, and a sharp black line is obtained by frequent pointing of the pencil on a pad or file. Some companies insist that all dimensions shall read from the bottom of the sheet regardless of the direction of the dimension line. Others give all dimensions in decimals. It was discovered that good lettering is considered to be important but that the letters used are somewhat smaller than those used in school drawing. It was noted also that the light guide lines used for printing are not erased since they usually fade out in making a print and so are not objectionable.

Teachers frequently insist that a drawing must have two or three views in order to be complete. However, it was found that in industrial practice only as many views of an object are drawn as are necessary to adequately describe the piece. If one view and a note telling the thickness will show what is needed, that is all that will be given. Needless detail and all but the important hidden lines are omitted.

Because designs and models change frequently, the useful life of a tracing may be short. In most cases, this fact alone is enough reason for making only pencil tracings. Added to this, however, modern blueprinting equipment makes it possible to obtain good prints from pencil tracings. In spite of this emphasis on pencil tracings, the inked tracings are still used to some extent and fill a very definite need where permanence, long life, and extremely clear prints are required.

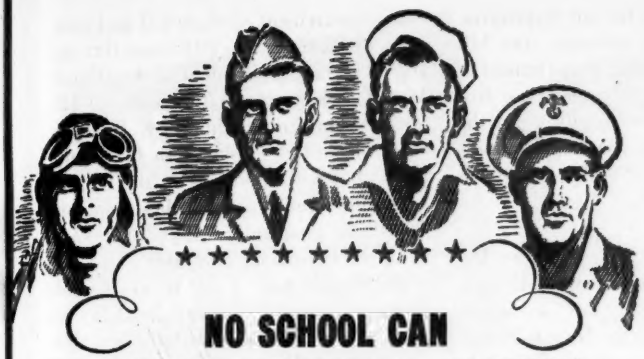
This is particularly true in the case of certain drawings for the Armed Services which are required to be inked. It was noted also that much of the lettering on drawings is done with the aid of lettering guides. This is believed to be relatively easier and it insures that the letters are much more uniform.

Another departure from common practice in school drawing appeared when it was found that on some production drawings where a large amount of data is necessary, notes and specifications are typed directly on the tracing. The print taken from this typing is acceptable if a new typewriter ribbon has been used. This method is useful when it is necessary to get a print in a hurry.

The teacher who is gaining experience in an industrial establishment is likely to be impressed with the thought that few draftsmen have a need for a complete set of drafting instruments. Except in rather rare instances, only one or two instruments are used regularly. This practice suggests that schools might encourage the use of some of the recent sets which contain only a combination compass and a ruling pen. It should be of special interest under present conditions when instrument sets are difficult to obtain.

One unusual technic used by some draftsmen in the design and developmental field should be of value to drafting teachers. It is valuable as an aid in visualizing particularly knotty problems. A lump of oil-treated modeling clay is used to rough out the part being designed. The resulting model is then refined or remodeled until the problem is solved. Instructors will find this an excellent method of illustrating problems that arise from drawings taken from texts. The clay is easily and quickly worked to the desired proportions and serves as a good visual aid. When the problem has been solved the clay can be worked over again. This method has the added value of providing an interest factor which should appeal to pupils of high-school age.

When the drafting instructor has finished his term of employment, he will have learned a great deal about how the draftsman works in industry. When he returns to school the question may arise in his mind, "Should he change all of his drafting courses to fit in with what he has observed?" Before deciding this question some thought should be given to the percentage of students who have gone or will go into drafting as a profession. If the percentage is high, school work should be geared to industrial practice. If it is low, the need for this adjustment is not so urgent. However, be it high or low, teachers of drafting in our public schools may learn much from the contacts made during a summer spent in the drafting room of an industrial plant.



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news

WHAT'S DOING IN THE FIELD OF INDUSTRIAL EDUCATION

THE so-called "Area Vocational School Bill" has been introduced in this Congress as S. 619 in virtually the same form as it was introduced in the last Congress. The sponsors are Senators George, Thomas, Hill, LaFollette, Aiken, and Ellender. The bill has been referred to the Senate Committee on Education and Labor. Calling for an appropriation of $97,500,000 annually, the bill provides for increased appropriations to vocational fields already receiving federal financial support as well as for the establishment of area vocational schools and a small appropriation for industrial-arts education.

ANNOUNCEMENT has been made by Dr. Henry T. Heald, president of Illinois Institute of Technology, of an initial grant of $15,000 from the Ohmite Manufacturing Co., to be used for the establishment of a laboratory for the precision measurement of electrical and magnetic quantities. The gift came through David T. Siegel, president of the Ohmite Manufacturing Co., and a trustee of Illinois Institute of Technology. It represents the initial contribution for equipping what will be known as the Ohmite Laboratory for Precision Measurements. It will be constantly expanded as new equipment becomes available. The laboratory's ultimate goal is to provide precision electrical measurements for the Chicago area approaching in accuracy those of the Bureau of Standards in Washington, D.C.

THE ban on the holding of conventions of more than 50 persons has resulted in the cancellation of practically all state and regional meetings of professional groups in industrial education. A few state groups have broken up into small units and are holding one-day sessions which can be attended by persons close by and which do not involve hotel accommodations or train services. Groups in both Michigan and Indiana are sponsoring such local group meetings.

TWO firms have just been awarded the Army-Navy "E" for the fourth time for efficient war production—the Delta Manufacturing Co. of Milwaukee and the Plomb Tool Co. of Los Angeles.

CALIFORNIA educational leaders and representatives of more than 50 agencies active in the guidance of veterans attended a two-week conference at California Polytechnic College conducted jointly by the division of readjustment education, the bureau of occupational information and guidance, and the College. The conference developed a broad, overall view of the services available to veterans, and the division of readjustment education plans to publish a manual on the subject. According to plans formulated at the conference, the division will also provide leadership on an itinerant basis for any community which needs help in getting its local groups together to develop community plans for veterans' guidance.

SOME 49,236 trainees have been enrolled in war-training courses at Burgard Vocational High School, Buffalo, N. Y., in the period from July 1, 1940, to October 1, 1944. Of these, 20,453 were given pre-employment training; 26,727, supplementary or upgrading training; and 2,056, retraining of some sort. Of the total, 10,851 were women trained for war jobs.

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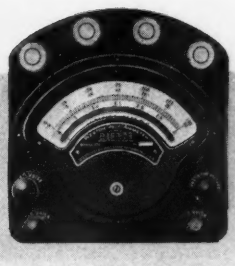

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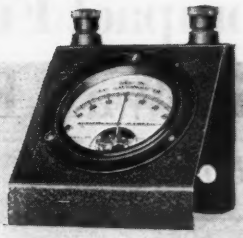

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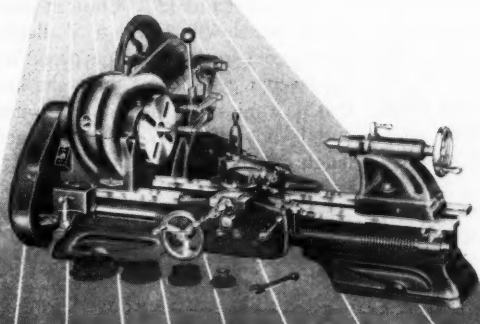

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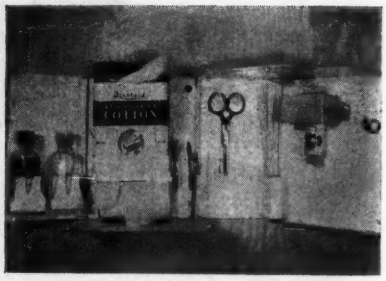
Compact First-Aid Wall Kit

BY *Philip H. W. Winsor*

Even with the most thorough safety program, minor cuts and scratches are inevitable in the school shop. Here is a handy shop-made kit that will be a boon to the teacher who has to treat these minor ailments. The author teaches in the Lodi Union High School, Lodi, California.



TESTED INSTRUCTIONAL PROJECT

THIS first-aid kit was designed and made for the school shop where the problem of keeping first-aid material in a clean, serviceable condition is difficult. All too frequently in school shops the materials for the administration of first aid are sliding around in a drawer of the teacher's desk or an old bench with resultant lack of sterility and inconvenience in using.

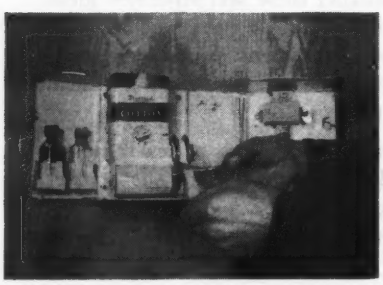
Even in shops where a first-aid cabinet is all ready in use (usually an adaptation of the home medicine cabinet) the compactness and rigidity of the cabinet illustrated here are lacking.

The case itself is made of sheetmetal. This one happened to be made from the door panel of an old Buick. The cost was negligible and the work is within the ability of boys from the ninth grade on.

The side sections are hinged to the back by means of rivets at the corners. The front is hinged by the same method to one of the side panels. This method of construction allows the cabinet to be opened up so that all the panels lie flat against the wall, making access to the various items in the cabinet very easy.

Space is provided for two bottles of antiseptic, a standard box of absorbent cotton, two sizes of gauze, adhesive tape, scissors, applicator sticks, and a device for squeezing a tube of Unguentine. This device was purchased ready made at a local drugstore.

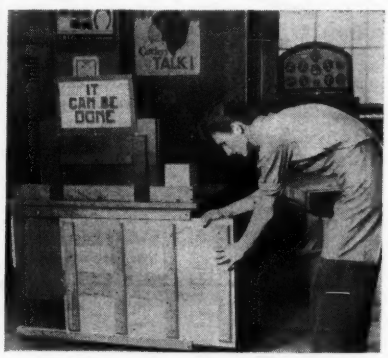
The cabinet is finished in white enamel with red lettering on the front.



Want a Handy Place for Your Drawing Board?

BY *Benjamin Gold*

Teacher of Industrial Arts, Bensonhurst Junior High School, Brooklyn, N. Y.

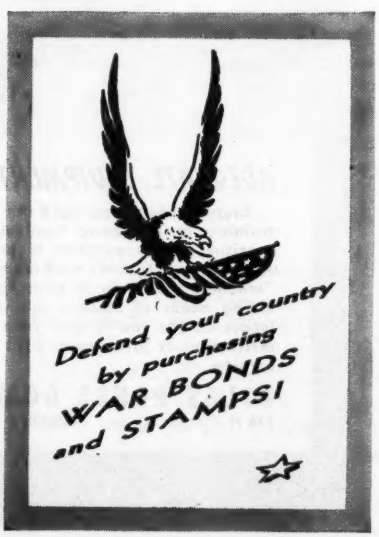


NO alert shop teacher is without a large drawing board on which he makes his class charts and drawings. But where to keep this large board without damaging its face and edges? The accompanying photo is suggested as an answer. I've been using it for some time and find it quite satisfactory. It can be made and installed in 30 minutes.

The sketch shows how the track was assembled. If your desk won't accommodate the drawing board, the two tracks can be fastened to any other suitable location.

Rubbing a bar of soap on the lower rail serves to lubricate the movement of the board. A stop block is nailed at the left end of the track to prevent the board from going out too far.

The reader may notice the long spike hanging at the right edge of the panel on my desk. It is my subtle answer to the many requests I, like any other shop teacher gets from teachers who want to hang a picture, etc., "May I please have a nail?" Close inspection of the panel will reveal a 5" flat-head screw, used for the same purpose. When the teacher gets one of these she knows that I want more definite information and is not offended, but rather gets a laugh out of it.



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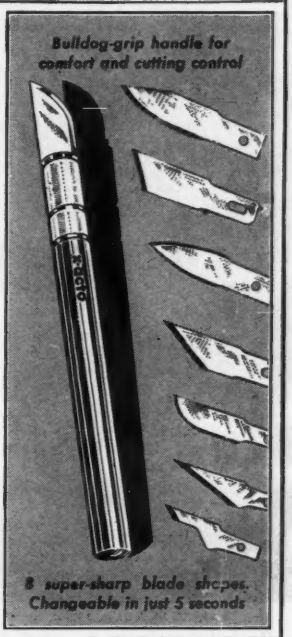

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1st prize—$50 War Bond
2nd prize—$25 War Bond
3rd prize—$10 in War Stamps
Seven prizes of $5 each in War Stamps

Unit Shop

1st prize—$50 War Bond
2nd prize—$25 War Bond
3rd prize—$10 in War Stamps
Seven prizes of $5 each in War Stamps

Rules of Contest

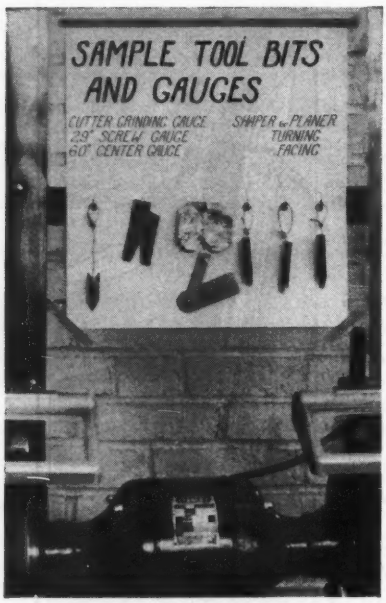
1. State problem which layout is to solve, emphasizing educational implications. Use 150 words or less in this statement.
2. Make drawing showing how you plan to solve the problem. The drawing should show doors, windows, placement and kinds of equipment, and any other details that indicate how the shop will operate at maximum efficiency. A fancy drawing is not necessary. Constructive ideas are more important. Comments may be attached to drawings.
3. Unit shop layouts can be in any of the fields of industrial education.
4. Indicate on entry whether it is for general shop or unit shop contest.
5. Do not place your name on drawings or comments. Place your name on a separate slip of paper and fasten it securely to the entry.
6. Contest entries will be the property of SCHOOL SHOP and cannot be returned.
7. The decision of the judges will be final.
8. Entries should be sent to School Shop Contest, 330 South State Street, Ann Arbor, Michigan. No entries will be accepted which are postmarked later than September 15, 1945.

School Shop KINKS

A dollar will be paid for each "Kink" published. Send to the Editor, SCHOOL SHOP, Ann Arbor, Michigan.

Sample Bits

Machine-shop students find sample tool bits useful for comparison when



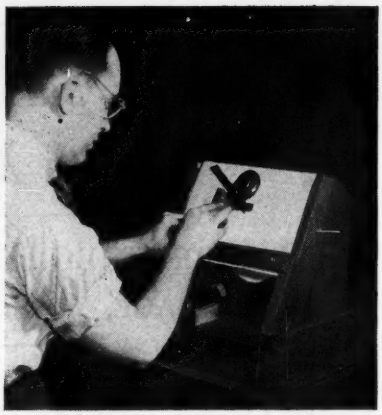
grinding their own. I grind samples from cold rolled square bar stock and drill holes in each for hanging by strings from hooks near the grinder. You can rest assured the students won't take these bits to use on the machines to save grinding their own.—*Linwood A. Abbott, Vocational Metal Trades Director, Morse High School, Bath, Maine.*

Sawdust Hole Filler

Nail holes or screw holes may be filled with fine sawdust of the same kind of wood mixed with hot or cold glue to a paste. Give the hole a thin coat of glue before applying the sawdust. When properly applied this filler will not be visible. After the glue has set, pare the filler down to the wood with knife or chisel. If hole is large, a piece of wood may be glued in place and planed down. Sandpaper all patches smooth.—*Harold O. Akeson, High School, East Orange, N. J.*

Illuminated Ground Glass Inspection Plate

An illuminated ground glass inspection plate has been devised at General



Electric's Pittsfield Works as a simple, quick means of checking angles on tools or matched cutters. The glass is set in a wooden frame at an angle of approximately 65°. The light source under the plate is a standard 100-watt lamp.

The tool being checked is placed on the plate and the protractor or template is placed against the side of the tool. Any error is immediately discernible. The method provides a positive check against the true cutting edge of the tool, which is not always possible when the protractor is held in one hand and the tool in the other.

This inspection plate is inexpensive and simple to make.

Ⓗ Individually Tested
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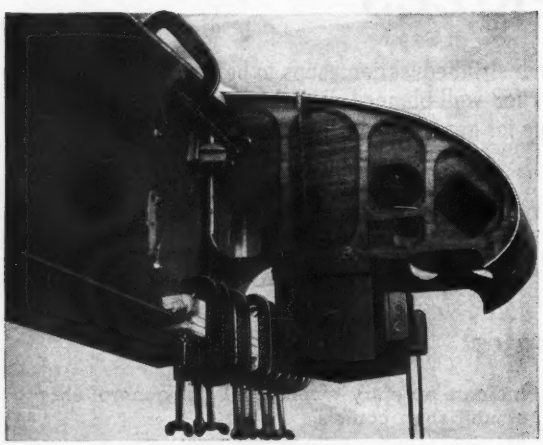

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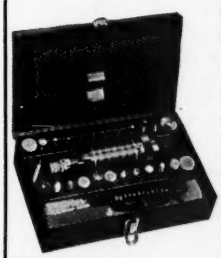

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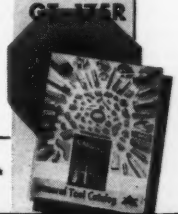

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INSTRUCTIONAL RESOURCES

Inquiries concerning materials described in these columns may be addressed to SCHOOL SHOP, 330 South State Street, Ann Arbor, Mich.

BOOKS:

Soul of Amber. Still. New York: Murray Hill Books, Inc., 1944. Pp. xiii + 274. $2.50.

The history of electricity is fascinatingly told in *Soul of Amber*. It mines three rich parallel veins: first, the progress of discovery in the science of electricity; second, the lives and personalities of the men who contributed to that progress; third, and most significant, the account of how men learned to think about their thoughts. Moreover, the author evaluates and records the effect of contemporary philosophy, religion, art, and politics upon the state of science. The eleven chapters of the book carry the reader from the first recognition of electricity as the subtle spirit of amber, through the coordination of lightning and electricity, down to Faraday and his experiments and their implications.

Alfred Still is author of *Electric Power Transmission, Elements of Electrical Design,* and other books.

Careers in the Steel Industry. Leyson. New York: E. P. Dutton, 1945. Pp. 191. $2.50.

So important is the steel industry that its current status is used as an index to the state of our national economy. In this book, the author presents in as detailed form as the restrictions of a single volume permit the steel industry and the major opportunities for a career in this vital part of our national economic structure.

The making of steel is followed through its various processes, and on the completion of this phase, the author details the various opportunities for employment, remuneration, and the possibilities that work in each process presents.

Captain Burr W. Leyson is the author of a long, well-known list of career books.

The Science of Clocks and Watches. Rawlings. New York: Pitman Publishing Corporation, 1944. Pp. ix + 235. $3.50.

Treating a subject as old—or older—than history, this book is a distillate of horological science told in readable, understandable style.

All readers will find something of interest, for even the purchase of a reliable timepiece is treated.

A single book on horology as a craft, as an art, and as a science would probably do justice to none of the three branches. But since the most popular clock book ever written, Grimthorpe's *Rudimentary Treatise,* has long been out of print, Mr. Rawlings attempts to supply in his book the answer to a great need; considering the many new interesting developments which have occurred in the science.

A. L. Rawlings is the Temporary Principal Experimental Officer, British Admiralty Compass Department. An expert in gyroscopic compasses, his book on the *Theory of the Gyro-Compass* is a standard work.

Household Mechanics. Bedell, Gardner. (2nd Edition.) Scranton; International Textbook Company, 1945. Pp. xii + 241. $2.00.

This revised and enlarged edition of what was already one of the most comprehensive books in the general shop field contains more information about household appliances, a larger selection of jobs, and retains all the best features of the first edition.

The jobs and problems presented hold the interest of girls as well as boys. Each job and lesson has been selected from the notebooks of experienced teachers. Preceeding each of the 148 jobs, the essential information for doing the job will be found. Then the step-by-step procedures guide the pupils in developing good habits of work. At the same time, there is a skillfully arranged set of questions and selfappraisal guides which insure a maximum amount of pupil problem solving. Exceptionally well illustrated.

Earl L. Bedell is the Divisional Director of Vocational Education of the Detroit public schools. Ernest G. Gardner is Supervising Instructor of Industrial Arts at Wayne University, Detroit.

Sheet Metal, Theory and Practice. Butler. New York: John Wiley and Sons, Inc., 1944. Pp. v + 173. $3.00.

At the outbreak of war, the establishment of new shipyards and the increased load thrown on established yards to meet the greatly augmented shipbuilding program inaugurated by the government quickly absorbed all available trained labor. The problem of preparing untrained men in a very limited time to perform those tasks which had formerly taken several years of training became very acute and demanding.

This book embodies all of the best features of a training program instituted to meet such a demand in a sheetmetal shop of a large West Coast Navy Yard. Most of the material is applicable to all branches of sheetmetal work. Pattern drafting has been purposely omitted, not because it was considered unimportant but because many books are already available covering that subject.

John C. Butler is the chief quarterman sheetmetal worker and supervisor in charge of training in the sheetmetal shop of the Puget Sound Navy Yard, Bremerton, Washington.

The Radio Amateur's Handbook. 1945 Edition. West Hartford, Connecticut: The American Radio Relay League. Pp. 728. $1.00 in U.S.A.; $1.50 elsewhere.

The new 1945 *Handbook* is a comprehensive, authentic digest of the older, familiar phases of radio theory and practice, combined with material covering more advanced technics.

This edition is divided into three main parts plus an introductory section. The principal parts are: principles and design; equipment construction; and general. This standard manual of amateur radio communication, revised, redesigned, and restyled to fit wartime and postwar needs, contains numerous illustrations, charts, tables, and basic formulas.

Popular Tools and Materials. Johnson, Fenn. Chicago: Albert Whitman and Company, 1944. Pp. 128. $1.50.

An elementary book describing more than 50 of the most common hand-operated tools.

The first portion of the text shows photographs in color of a boy or girl demonstrating the use to which each tool is put. The second portion describes many of the types of materials used for decorating woods and metals and a variety of fasteners.

William H. Johnson is Superintendent of Schools, Chicago, Illinois. Isadore M. Fenn is an instructor in the Chicago Vocational School.

PAMPHLETS:

Methods of Cam Milling, a booklet which is part of an educational service series, is designed to acquaint the mechanic with the various methods and attachments that may be used in milling cams. Written in nontechnical language and illustrated with numerous operational photographs and sketches. Available without charge to teachers from the Kearney and Trecker Corporation, Milwaukee 14, Wisconsin. *Please mention* SCHOOL SHOP.

Fundamentals of Industrial Electronics, GEA-4309, is a reprint of a series of eight articles on industrial electronics, written by G. M. Chute, Application Engineer, General Electric Company. Many recent developments in electronics of specific interest to the metal-producing and metalworking industries make this series especially significant. For a free copy of this publication write to C. P. Fisher, Jr. News Bureau, General Electric Company, Schenectady, New York, *mentioning* SCHOOL SHOP.

Newsfront, a new monthly publication, is announced by the Westinghouse Electric and Manufacturing Company. The first issue, which appeared in April, featured a story on a new application of the Precipitron air-cleaner for the removal of fly-ash. Requests to be placed on the mailing list should be addressed to the Editor, Westinghouse *Newsfront,* 306 Fourth Ave., Box 1017, Pittsburgh, Pennsylvania, mentioning SCHOOL SHOP.

VISUAL AIDS:

The Silver Anniversary Issue of the VISUAL REVIEW is announced by the Society for Visual Education. Included in the new issue is a history of S.V.E., an outstanding article by Ellsworth Dent, tracing advances in audio-visual education during the past quarter century, and other feature stories of the important part played by visual education in war and peace training. Copies are free upon request to the Society for Visual Education, Inc., 100 East Ohio St., Chicago, Illinois. *Please mention* SCHOOL SHOP.

16mm. Sound Motion Pictures to Help Teach Machine-Shop Work, catalog No. 1 of the Federal Security Agency, U. S. Office of Education describes in detail pictures planned to present the basic principles of the jobs shown. These films provide a demonstration of specific jobs, and in the course of the demonstration, stress safety, explain the principles involved, show the correct order of procedure, and show how an experienced worker goes about doing the job. Catalog No. 1 is free to teachers upon request. Write Castle Films, Inc., 30 Rockefeller Plaza, New York City, *mentioning* SCHOOL SHOP.

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Faculty members, University of Minnesota

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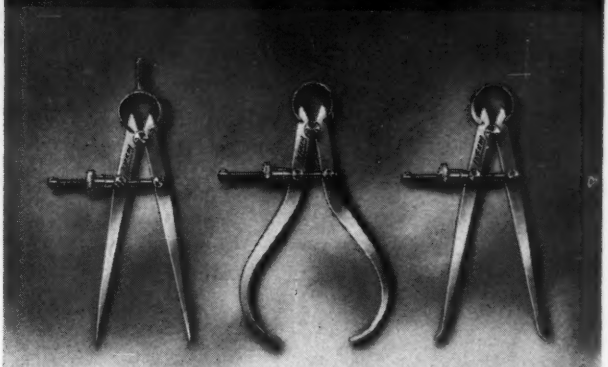

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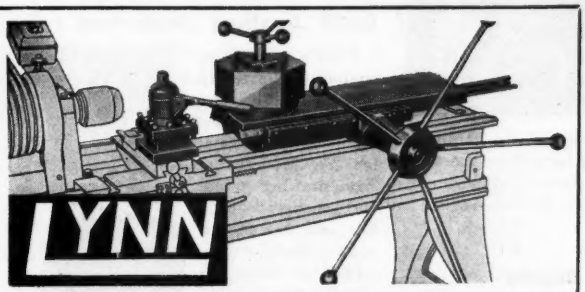

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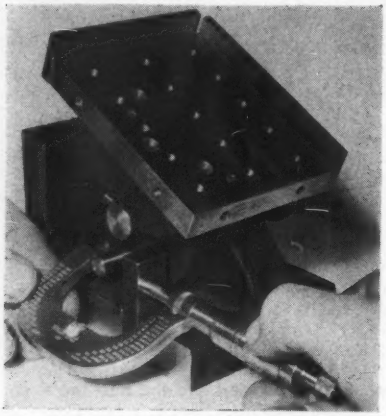
. . . news from INDUSTRY

Angles to a Minute In a Minute



The Bemisine is a new time-saving device for setting or measuring any angle from 0° to 90° to within one minute. The sturdily constructed tool requires only a 2" capacity micrometer and reference to the standard table of sines and cosines to determine and set any angle within its range in approximately a minute's time. The precision ground right-angular base supports an accurately drilled and tapped work-holding table, mounted pivotally so that it may be tilted to any angle up to 45°. Angles in excess of 45° are secured by resting this fixture on the second side of its right-angular base and computing the complementary angle.

For full details write the Nichols-Morris Corp., 50 Church St., New York, N. Y. *or check number 75 on the coupon.*

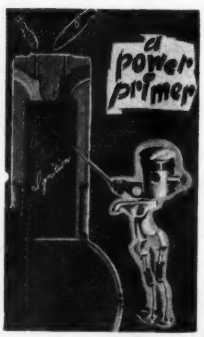
Facts and Figures on the Precise "35"

Precise Products Company announces a new descriptive brochure on their Precise "35" hand-tool. Applications of the tool, various attachments available for use with it and their specifications are included. Write Precise Products Company, 1328 Clark St., Racine, Wis., *or check number 76 on the coupon.*

The ABC of Electronic Heating is a 12-page brochure explaining the fundamentals of electronic heat and some of its applications. Specifications of standard generators and illustrations of new models are included. Write the Scientific Electric Division of "S" Corrugated Quenched Gap Co., 107-119 Monroe St., Garfield, N. J. *or check number 83 on the coupon.*

New Concord Radio Guide Book containing revised 1945 listings of radio parts and electronic equipment is available from the company at 901 W. Jackson Blvd., Chicago 7, Ill., *or by checking number 84 below.*

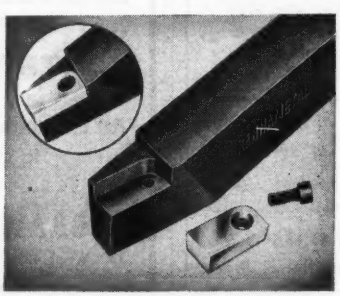
General Motors Power Primer



A Power Primer is another of the booklets issued by General Motors Corporation for training purposes. Based on the principle that "a problem thoroughly understood is always fairly simple," the booklet presents simple and elementary facts about automobile, aircraft, and Diesel engines in a straightforward and well-illustrated manner. Your copy of this 114-page booklet may be obtained by writing the General Motors Corporation, Detroit, Michigan, *or by checking number 77 on the coupon.*

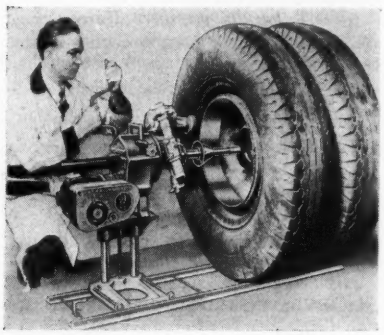
New "Screwed-on" Kennametal Tool Blanks

Kennametal Inc., announces a new type of Kennametal tool blank, having a drilled and counterbored hole to provide for attachment to steel shank by means of a recessed-head cap screw. The angularly set screw serves merely to hold the tip against the recess walls, which resist the main cutting thrusts. Advantages of the improved design include greater durability, more consistent performance, simplified fastening and tool making, and streamlined design with no projection beyond shank cross-section. Write for further information to Kennametal Inc., Latrobe, Pa., *or check number 78 on the coupon.*



New Barrett Brake Drum Lathe

Barrett Eqpt. Co. announces a new brake drum lathe which makes it possible to machine heavy brake drums easily without lifting either the wheels or lathe from the floor. It will accurately handle and turn any drum from motorcycle size to the largest truck or bus sizes with the tires on or off, and thus eliminates the necessity of hoisting heavy work for mounting on overhung shafts as is customary with conventional lathes. Offering a greater degree of precision, speed of operation, and universal application to the entire field of drum sizes and weights, these machines are now available in quantities, providing WPB approval is obtained. For additional information write the Barrett Eqpt. Co., St. Louis 6, Mo., *or check number 79 below.*



ESCO Drafting Equipment

Precision drafting equipment for every drafting need is listed in Engineering Sales Company's new catalog 2A. Modern design drawing tables and benches, drafting kits and boards, triangles, straightedges, parallel rulers, T-squares, pencil pointers and eraser shields are listed, with full details for ordering. Write the Engineering Sales Company, Sheboygan, Wis., for your free copy, *or check number 80 on the coupon.*

New Literature

How and Why Cathode Ray Tubes Work is an interesting descriptive bulletin covering the early history of the tubes, manufacturing problems, testing, and special designs. Available from North American Philips Co., Inc., 100 East 42nd St., New York 17, N. Y., *or by checking number 81 on the coupon.*

Alcoa Library—Sound Motion Pictures, Visual Aids and Booklets on aluminum, its history and various processes in handling it are listed in this 18-page brochure available from the Aluminum Company of America, Pittsburgh 19, Penna., *or by checking 82 on the coupon.*

Each item listed above is numbered. Check the numbers of the items you want, and mail the coupon, properly filled in, to . . .

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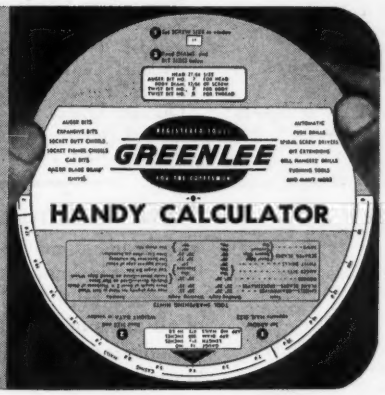

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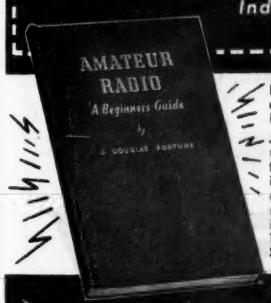

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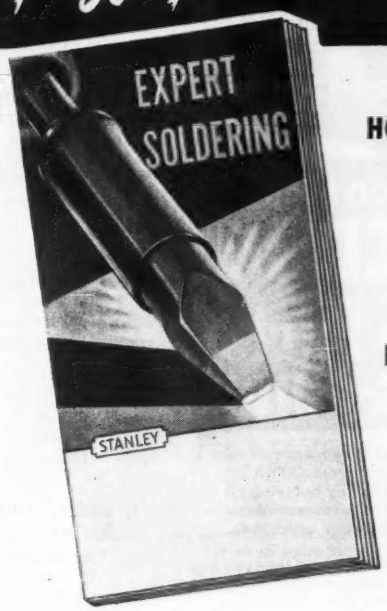

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Safety . . . . . *from page 6*

2. Hand tools.
3. Safety appliances and devices.
4. Housekeeping.
5. Illumination, especially at operating points.
6. Ventilation.

C. Guarding machinery and equipment.

1. Study of hazard.
2. Study effect of guard on production.
3. Obtain student's suggestions on guards.
4. Protect point of operation.
5. Protect moving parts of machines.
6. Protect power transmission.
7. Safeguard electrical equipment.

IV. What Effect Does Good Housekeeping Have on Safety and Production?

A. Neatness.
B. Proper storage of material.
C. Maintenance of aisle space.
D. A place for everything and everything in place.

V. How Can Accident Experience Be Determined?

A. Making report of all accidents.
B. Keeping accurate accident records.
C. Computing frequency and severity.
D. Comparison with other industries.

VI. How Can Accident Records Prove Helpful in Taking Remedial Action?

A. Study of records—determine chief causes and agencies responsible.
B. Taking immediate action to remove causes.

VII. How Can Interest in Safety Be Aroused and Maintained?

A. Regular meetings.
B. Visual aids.
C. Student suggestion system.
D. Pamphlets and posters.
E. Active participation.

The writer would like to recommend the following as aids to the instructor in conducting such a safety program, feeling that the information contained therein is quite adequate and not too costly:

Industrial Safety Education in Schools. Metropolitan Life Insurance Company, New York.

Handbook of Industrial Safety Standards. National Conservation Bureau, New York.

Accident Facts. National Safety Council, Chicago, Illinois.

Industrial Safety. Edited by Roland P. Blake, Prentice Hall, Inc., New York.

from Washington *from page 32*

who heads it may lose his uniqueness but not his importance. By taking his place in a full council of representatives of all areas of education under the U.S. Commissioner, he will be able to assert his influence on elementary, secondary and higher education. Ideas will have a greater chance to cross-fertilize. What has been called the "separateness" of trade education will tend to break down; and the vocational education activity would be improved.

And, if some states follow the example of the federal government and assign less impressive titles to their vocational education leaders, they should also be asked to do what the government is recommending: raising salaries at the same time.

Electronics . . . . . *from page 14*

(more than one hundred) of available General Electric publications on electronics. A few of which are: *Electrical Developments of 1943, Electronics—A New Science for a New World, How Electronic Tubes Work, Electronics—Fire of the Future, The General Electric House of Magic, Industrial Electronics.*

Westinghouse Electric and Manufacturing Company, Bloomfield, N.J.: *Electronics at Work.*

3. Specific electronic information that can be obtained free of charge from manufacturers.

General Electric Co., Dept. 6-215, Distribution Section, Schenectady, N.Y.:

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Electronic Control in Industry, Electronic Instruments, Electronics and Electron Tubes, fundamental information on vacuum-tube theory, *Experimental Electronics,* G.E.T. 620 A and G.E.T. 566 B, laboratory experiments on electron-tube applications, *The G.E. F.M. Primer, Television.*

Westinghouse Electric and Manufacturing Company, East Pittsburgh, Penna.: *High-Frequency Heating Equipment, Electronic Control for Resistance Welding, Mot-O-trol, Ignitron Rectifiers, Ignitron Unit Substation, Power Line Carrier Equipment.*

Department of Information, Radio Corporation of America, 30 Rockefeller Plaza, New York: *Into Unseen Worlds—The Story of R.C.A. Electron Microscope, Television—Progress and Promise.*

Radio Receptor Company, Inc., 251 West 19th St., New York 11, N.Y.: *Highways of the Air.*

4. Magazine Articles.

"'Electronicise' Your Electricity Course," Ralph O. Williams, SCHOOL SHOP, Oct., 1944.

"Learning Electronic Circuit Elements," Morris Slurzberg and William Osterheld, SCHOOL SHOP, Jan., 1945.

"Postwar Opportunities for Servicemen and Technicians," Samuel Freedman, *Radio News,* June, 1944.

"Electronics in Medical Science," Rufus P. Turner, *Radio News,* June, 1944.

"Electronics—Postwar Industry," A. C. Montieth, *Radio News,* Dec., 1943.

"New Devices for Industry," Willard Moody, *Radio News,* Feb., 1943.

"Wartime Progress in Electronics," Robert Eichberg, *Radio News,* June, 1943; March, 1943; May, 1943; and July, 1943.

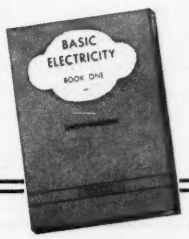
"The New World of Electronics," *Electronics,* March, 1943.

"Electronic Applications," *Electronics,* Oct., 1943.

"Basic Electronic Circuits and Tubes," *Production Engineering,* Jan., 1944.

"Basic Electronic Circuits for Industrial Functions," *Production Engineering,* Feb., 1944.

NOTE: Reprints of these two articles in *Production Engineering* may be obtained from Westinghouse Electric and Manufacturing Company, East Pittsburgh, Penna.



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from WASHINGTON by MICHAEL PACA

OF ALL educational interests in Washington, the vocational leadership alone has not yet approved wholly the plan to strengthen the U. S. Office of Education.

The point at issue revolves around the present assistant commissionership for vocational education. Under the new plan, which Congress began considering on April 15, the title of assistant commissioner would be changed to director for vocational education. Many trade and industry teachers do not like the overtones of this change. They fear that by changing the name of the position, vocational education would be moved down a notch. Some suspect that it is "another step by the Administration to submerge vocational education," the first step supposedly having been taken in 1934 when the Federal Board for Vocational Education was coordinated with the Office of Education. A dollar-and-cents factor disturbing some vocational leaders is their concern that the change in title at the federal level might affect adversely the top positions in the vocational field in some of the states.

This concern on the part of vocational people has challenged your reporter to get to the bottom of this issue. Your reporter has searched for the answer wherever he could find unbiased facts. He has probed not only the highest authorities in the Office of Education—who might presumably be prejudiced—but also workaday shop people and finally officials of the Executive Office of the President, where final decisions on reorganization of any federal agency are made.

● First, then, what will take place if the present proposals are approved? To the Vocational Education Division as it now stands would be added 13 professional staff members and 21 clerks. Each phase of vocational education would be assigned new specialists. Salaries of the chiefs of agricultural, trade and industry, home economics, business education, and occupational guidance and of regional agents in these services would be increased. The salary of the head of the entire division would be raised from its present maximum of $7,500 to a minimum of $8,000. His Civil Service rating would be raised from P-7 to P-8. (Incidentally, P-8 is the grade of the U. S. Commissioner of Education himself.) The title of the head of that division, however, would be changed from assistant commissioner for vocational education to director.

Why make this change? What effect would it have on vocational education as a whole?

● Some little known facts should be told at this point. Your reporter has long known that the plan to strengthen the Office of Education was drawn up not alone by the U. S. Commissioner of Education. Among those who have guided him have been officials of the Executive Office of the President and its Bureau of the Budget. Here is the final arbitrer in government planning. Its "Yes" or "No" is all-important to any project. And this bureau might well be drawn with its eyes blindfolded and its scales in balance. For the Bureau of the Budget (more directly, its division of administrative planning) is concerned with all phases of education, as well as with balanced organization and good management.

When, therefore, Commissioner Studebaker came out of the offices of the Budget Bureau he carried a chart of organization in which vocational, as well as elementary, secondary, and higher education, were to be represented by stronger divisions and more ample staffs in the Office of Education.

● The next question was one of nomenclature. What should the heads of the major divisions be called? Associate Commissioners? Assistant Commissioners? Directors? Assistant to the Commissioner? Any one of these labels was agreeable to Commissioner Studebaker. It was decided that under government usage the term director was advisable for the heads of major operating divisions. The term assistant commissioner was reserved to two coordinating officers. These coordinating officers would handle the details—but not the policy questions—affecting the major divisions. The Commissioner would thus get some much needed help and could be freed for important policy problems. The directors of the division would still have direct access to the ear and eye of the Commissioner.

Your reporter has learned that Dr. Studebaker is willing to label his two coordinating officers associate commissioners, thus leaving the title of assistant commissioner for the head of the vocational division and the other divisions of education. But the Bureau of the Budget has not agreed to this. For, the bureau, as the watchdog of all government, has to reckon with the uniform, if complex, structure of positions throughout all departments.

Thus, the controversy flounders in a sea of verbiage. The man who gets the job heading the vocational education division would perform exactly the same functions no matter what label is pinned on him. He will not be cut off from the "front office," regardless of his title. No authority will be taken away from him as director; and no new authority will be given him should he carry the title of assistant commissioner.

● Today, the assistant commissioner for vocational education is an influential and unique figure. His position is magnified by the fact that the other areas of education are weak, very weak, in federal leadership. But by bringing the other areas up to the strength of the vocational education division, the man

(Continued on page 30)

Index to Advertisers

Allen, James & Co. 31
Armstrong Brothers Tool Co. 24
Atlas Press Co. 21
Automotive Maintenance Machinery Co. 15
Barrett Equipment Co. 4
Boice-Crane Co. 14
Brodhead-Garrett Co. 19
Carboloy, Inc. 25
Casein Co. of America 21
Chicago Tool & Engineering Co. 31
Chicago Wheel & Mfg. Co. 25
Cincinnati Tool Co. 24
Colton's File Cleaners 25
Concord Radio Corp. 30
Continental Machines, Inc. ..... cover 4
DeVry Corp. 30
J. A. Fay & Egan Co. 25
Franklin Glue Co. 29
Greenlee Tool Co. 29
Paul K. Guillow 25
Jam Handy Organization 13
Indianhead Archery & Mfg. Co. 25
Kearney & Trecker Corp. 2
Lufkin Rule Co. 27
Lynn Mfg. Co. 27
Manual Arts Press 19
McGraw-Hill Book Co. 27
Meissner Mfg. Co. 9
Pittsburgh Plate Glass Co., Paint Division ..... cover 2
E. H. Sheldon & Co. 16
Sheldon Machine Co. 20
Skilsaw, Inc. 17
Stanley Tools 29
Stanley Electric Tools 17
Stokes Industries ..... cover 3
Thordarson Electric Mfg. Co. 29
Universal Scientific Co., Inc. 31
Victor Animatograph Corp. 3
Wayne University 31
Weston Electrical Instrument Co. 21
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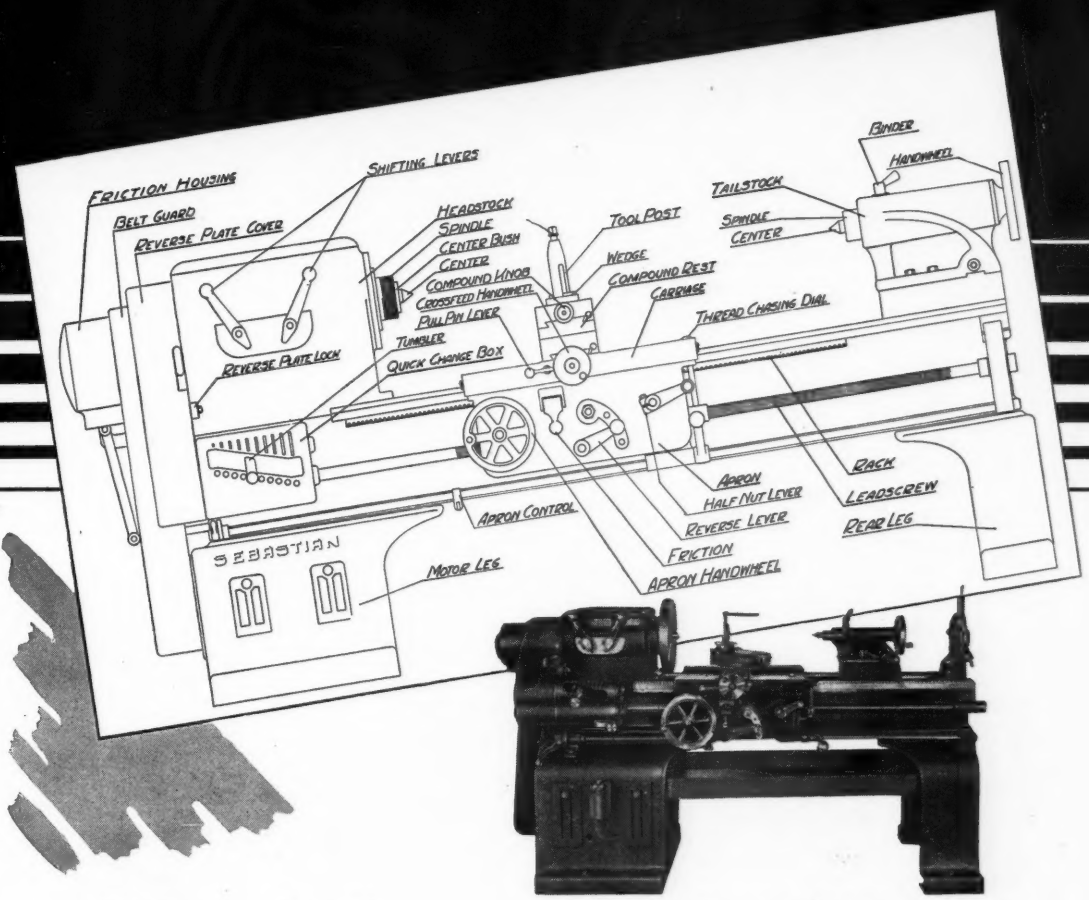

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